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THE United States Association of Charcoal Iron-Workers will hold its annual convention at the Park Avenue Hotel, New York City, Tuesday evening, October 20th.

THE Nova Scotia Meeting was a memorable one, and, with the exception of the Colorado Meeting, probably the largest, as it was one of the most agreeable, in the history of the Institute.

THE report of the Cape Breton excursion is given on another page, and will be a pleasant reminder of joyous days to those who participated in it. We shall again have to postpone the notice of the Londonderry and Spring Hill mines.

MR. EDMUND C. PECHIN, M.E., a valued contributor to the ENGINEERING AND MINING JOURNAL, has joined the staff of the Cleveland *Iron Trade Review*, as associate editor. We congratulate our esteemed contemporary on having secured the services of so able a writer and experienced a metallurgist as Mr. PECHIN to take charge of the department devoted to "the practical and commercial aspects of iron and steel making." It could scarcely have been more fortunate in its choice, or have found a more able representative of iron metallurgy or a more graceful and pleasing writer. We wish the *Review* every success.

THE ELECTRO-CHLORINATION OF GOLD ORES.

The "Cassel process," described in the ENGINEERING AND MINING JOURNAL of August 8th, is not, it appears, original, but in all essential features it was tried in this city some years ago at a works where Mr. H. R. CASSEL was employed ; and even though Mr. CASSEL may have made "improvements" in details of the process as he found it here, they would, we understand, belong to the company for which he was working.

The process was not practically successful, though it offered some interesting results, and so far as its chemistry is concerned, it is theoretically quite ingenious. In the revolving drum with the carbon rods, and filled with ore, salt water, and lime, the reactions that take place are stated by Mr. CASSEL to be as follows : "Nascent chlorine and nascent oxygen are generated by electrolytic decomposition of an aqueous solution of chloride of sodium, whereby the auriferous pyrites are decomposed. The gold, becoming free, is converted into auric chloride, and is precipitated by the salts of iron, antimony, etc. Addition of lime, consequent precipitation of all metals except gold, which, as long as the solution is kept alkaline, is deposited at the cathode, until the last traces of it are extracted."

In another column, will be found an interesting letter on this subject. We think it possible that our correspondent has misunderstood the construction of the barrel ; but his calculations are interesting and easy of verification.

Notwithstanding the prominence given to this *new process* in the London engineering and mining papers, and the assertions made of wonderful results obtained or obtainable at a cost of from $1.25 to $2.50 per ton of ore treated, we are inclined to look upon the statement made as requiring confirmation by higher and disinterested authority. Mr. CASSEL'S record while in this country was not such as to inspire unlimited confidence in him.

THE WAY MINES ARE SOLD IN ENGLAND.

Our remarks several weeks ago on the consolidation of the Atlanta with the Copper Queen have been very unjustly construed into a reflection on the American owners. Neither our words nor our intentions warrant any such interpretation—quite the contrary, in fact. And the failure of the negotiations seems to indicate that the American owners were unwilling to assist the English promoters in effecting a sale upon statements that were, to use a very mild term, *erroneous*. That the mine, after so many years of a steady output, is not what it once was, is to be expected ; therefore, it is to the credit of the Queen Company that it should consolidate on equitable terms with a neighbor and thus legitimately increase its resources, rather than invest its means in the uncertainties of a lawsuit.

We shall, however, never cease to warn the public here and in England against false and deceptive valuations, whenever the facts come to our knowledge.

The processes by which the public on this side of the Atlantic is inveigled into investing in worthless mining schemes are nefarious enough ; but they have not been systematized and codified, so to say, as have been the methods in vogue in England, nor is the formation of public companies here reduced to so exact a science as on the other side.

Among the congressional documents for the year 1876 is a bulky volume that exposes those methods. It contains the history of the sale of the Emma mine in London. This is an old story, but worthy of repetition ; for it is constantly re-enacted by different people with only slight differences of detail.

The Emma silver mine, in Utah, had begun to yield profits in 1871, when, as usually happens in the West, claimants to the property at once sprang up to contest the title of the occupants. In the Emma case, litigation ceased on the understanding that the mine should be sold and the profits distributed in stipulated proportions. Mr. LYON, who claimed a one-third interest, agreed to take $500,000 for his share. Mr. TRENOR W. PARK, the largest owner, and Hon. Mr. STEWART, acting as counsel for LYON, went to London. For some months previous, as much ore as the mine could be stripped of had been sent forward and sold in England with as much publicity as possible. Arrived in London, Messrs. PARK and STEWART were introduced by a banker, who is always a prominent member of such bands of conspirators, to Messrs. COATES & HANKEY, brokers. The terms of the plot—for it can hardly be called a sale—were now arranged ; but Messrs. COATES & HANKEY, being too weak

to carry them out, resigned in favor of Albert Grant, the most astute company-monger of the age.

When once a broker undertakes a job of this nature, he becomes arch-conspirator. Venders and all others are expected either to be quiescent or to obey his injunctions, and to say and do, without question or compunction, what he commands. The broker finds directors, concocts the prospectus, fees newspapers, manipulates the stock, and generally, as *deus ex machinâ*, makes what is worthless appear as of untold value, and a swindling extortion look like a generous gift to the public. When, however, a man as notable or notorious as Baron Grant is secured, he never appears upon the stage.

In the Emma affair. Grant was fortunate in having the assistance of two such able and skilled operators as Park and Stewart. While he selected names for his long list of available directors (all prominent brokers are supposed to have at command a number of influential directors' familiarly called "guinea pigs," including a fair sprinkling of M.P.'s and of needy noblemen, to whom the fees are a consideration and who are too ignorant to be inquisitive), Messrs. Park and Stewart went in search of a man ostensibly to protect the interests of the American shareholders of the company, and by a happy accident they secured the services of the American Minister.

Having selected a strong board of well-known men, whom the unwary public supposed to be heavy investors, but who, in fact, besides receiving a salary of £500 a year each, had been duly qualified by a donation of stock, the prospectus was issued. The property, which by transactions among themselves the sellers had valued at $1,500,000, was offered at $5,000,000. A dividend of 1½ per cent a month, equal to 18 per cent on the capital, was guaranteed, and was to be paid out of resources on hand and out of ore in sight, said to be of the net value of £357,750. The public, however, were not informed that of the £1,000,000 they were asked to give for the mine, Baron Grant, of whom they had never heard in that connection, was to get, as his fee, almost as much as the mine was deemed by the venders to be really worth ; that the lawyers, who drew up the prospectus so cunningly that the public would have no redress when they should discover themselves swindled, were to receive a comfortable fortune ; and that the bankers, who had merely introduced Messrs. Park and Stewart to Messrs. Coates & Hankey, were to have what would serve many a small banking firm as capital; that the brokers who had been too weak to engineer the scheme should receive, nevertheless, a consideration for handing it over to the baron ; and that even the metal brokers who had previously sold the ore on a good commission were to be richly recompensed for the loss they might sustain should they not continue to be employed by the new organization. These and other equally significant facts were kept carefully concealed ; the public rushed to subscribe, and the amount demanded was offered twice over.

The subsequent history of the mine is curious. Although the public paid £1,000,000 for it, not a farthing was reserved for working capital. The mine was productive when purchased, and the ore on hand was sold with the mine. Enough, therefore, was extracted to pay working expenses and twelve 1½ per cent dividends. A thirteenth was paid, but the amount was borrowed from Mr. Park on the security of the ore in transit. The ore did not cover the advances, and the company remained in debt to Mr. Park. There being no more productive ground within reach, and no money wherewith to make explorations, mining was stopped and litigation begun, for which stockholders were willing to furnish the means, though they had declined subscribing a penny for exploratory work in a mine that apparently had yielded £180,000 profit in a twelvemonth.

When such large sums are realized with so little labor, of course the broker can afford to be liberal, and to throw about thousands of pounds more lavishly than most men would their pennies. Thousands are used to bribe newspapers, a fact proved in a court of justice to the disgrace of British journalism ; bankers are paid to lend their names ; brokers in all parts of the kingdom are paid to make fictitious bids for the stock ; men in the highest standing in the community are paid to serve on the board ; and when the trap to catch the public has by such means been well baited, prospectuses are showered over the kingdom by hundreds of thousands, and are supplemented by special articles of leading newspapers. One copy is sure to reach every widow with a small income, and every needy clergyman. Both these classes being pinched for means and credulous, are liable to be tempted to buy shares. The broker counts that among so many hundred thousands there is sure to be a given proportion of fools who will be duped ; therefore, the more dubious the speculation, the greater the number of prospectuses, and the more extravagant the promises.

Carlyle classified the population of Great Britain as "forty millions, mostly fools," but the great English promoters have graded the British fools according to degrees of gullibility. They have in their offices bookcases filled with bound volumes containing a directory of the whole kingdom, every possible subscriber, male or female, taking rank either in a small upper class, *a*, if possessed of both wealth and penetration, or in one of the large lower classes, *b*, *c*, etc., which comprise the credulous and needy. A very small edition of a prospectus privately issued to class *a*, offering a sound investment, insures its acceptance. But an issue of half a million prospectuses, bulky as a volume, may be necessary to catch enough credulous subscribers of small sums to yield the grand total. Thousands and thousands of dollars are spent on printing and postage. The risk is therefore great, but the stakes are heavy.

There can be little doubt but that this system of raising joint-stock companies and afterward so manipulating them as to conceal the fraud, to which all concerned have been knowingly or inadvertently parties, has done more than any thing else to corrupt commercial morality in England. The chief conspirator, the broker, may be the chief criminal ; but the man who bonds to him knowing that he will use his property to perpetrate a fraud, is not innocent ; the director who accepts qualification shares, which he is supposed to have paid for, or who sells or lends his name to be used to assist in floating an enterprise on more or less false or fraudulent statements, of the character of which he is aware or even willingly ignorant, is an accomplice to a swindle, whatever his title may be.

Even if the property be intrinsically good, when sold above its value and all the money subscribed has been grabbed by the broker and his satellites, so that little or nothing is left to develop its resources, it may become unprofitable ; while if it prove valueless, a stigma attaches, not only to those who sold it, but to the whole community where it is situated.

This is an outline of the manner in which a vast number of mining properties situated in all parts of the world have been sold in London, and the English palate has become so accustomed to these highly seasoned prospectus lies and exaggerations that it is said by those who are well informed on the subject to be almost impossible to sell a mine in London at a fair and honest valuation. Under these conditions, it is not at all strange that English investors in mines, for the most part, lose their money ; it is almost a miracle when, through extraordinary richness, the mine withstands this method of floating and the additional load of the usual English management sent out by such a company, and pays a fair return to its stockholders.

CORRESPONDENCE.

[We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.
All letters should be addressed to the MANAGING EDITOR.
We do not hold ourselves responsible for the opinions expressed by correspondents.]

The Cassel Electro-Chlorination of Gold Ores.

Editor Engineering and Mining Journal :

Sir : In the Engineering and Mining Journal of August 8th, you referred to this so-called "new process," and you correctly questioned its value, even assuming some of the claims made for it to be well founded.

It may be of interest to the readers of the Engineering and Mining Journal to know something more of the process and its "inventor."

1. The idea of generating the chlorine in the ore from a salt solution by electricity *is not new ;* it was experimented on by Mr. E. N. Riotte at his works in this city some years ago ; and at that time, Mr. Cassel was manager of the Bullion Refining Company (since defunct) in this city, and witnessed these experiments.

2. As intimated by you, the fact is well known that chlorine can be produced very much cheaper from salt, manganese, and sulphuric acid, or from calcium chloride and sulphuric acid, than by electricity.

3. If a barrel of the size described by Mr. Cassel in his circulars, and containing 2½ tons of concentrates, were filled up with salt water, and all of this water were decomposed, a simple calculation will show that it would not furnish much more than half as much oxygen as is needed to oxidize the sulphur, arsenic, etc., in the raw ore of the charge.

4. If the barrel were air-tight, the hydrogen liberated would quickly burst it ; while if not air-tight, the chlorine would escape with the hydrogen ; or if hydrogen-sulphide were formed (?), the barrel would also burst, with slightly more horrible results.

5. If the results said by Mr. Cassel to have been obtained were actually produced, it must have been from an iron pyrites containing free gold, so that the pyrites were not necessarily decomposed. And on such an ore, an ordinary pan would have done the work much more quickly and economically.

6. It is possible to extract gold and silver cheaply from *thoroughly roasted* material in the manner described ; but this *is not new ;* it has been done by the Mears barrel, by Riotte's patent, and by other methods.

In short, Mr. Cassel's process is therefore neither new nor practical, as those who invest their money in it will learn to their cost.

Yours, etc., Muscular Amalgamator.

Sulphur Mining in Sicily.—Sulphur mining is in a deplorable state, brought about by overproduction. The development of Sicilian sulphur mining during the last ten years has been extraordinarily rapid. In 1872, the total production was two and a half million quintals ; in 1883, four million quintals. But since the latter year, prices have been constantly falling. During the first three quarters of 1884, 254,500 tons of sulphur were exported, and 103,000 tons remained in stock. The production of the last quarter was estimated to be 150,000 tons. In this state of things, prices have continued to give way ; they are now 30 per cent below those of 1883, and are likely to go considerably lower before the crisis is past.

THE PICTOU AND CAPE BRETON EXCURSION OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.

Special Correspondence of the Engineering and Mining Journal.

The Pictou and Cape Breton excursion was looked forward to by members of the Institute as the crowning glory of the Nova Scotia Meeting, and certainly the reality fully justified this anticipation. Though all who enjoyed the magnificent reception at Halifax wished to join the Cape Breton trip, the professional duties of many of the members rendered that impossible ; nevertheless, sixty-seven members and ladies united to form the jolliest band of excursionists it has ever been your correspondent's good fortune to meet.

This party left Halifax Friday morning, September 18th, for Pictou's mysterious mines of black diamonds and the unknown land of "Baddeck and that sort of thing." At Truro, we parted company with our genial President, several ex-presidents, and a large number of our members who proposed visiting the wonders of Londonderry, Spring Hill, and Grand Pré. Having thus relieved themselves of the restraint of authority, the "sixty-seven" immortals "went in for a good time," and, thanks to the unparalleled hospitality of our good cousins, "the blue noses," they had it, as I intended to show; but already the magnitude of the subject, and the superlative goodness of the time, have discouraged me, and I can only tell you *where* we had it, and just enough about it to make those who did not attend mourn their folly or their misfortune.

At midday, Friday, Stellarton was reached by our "special," and we were received by John McDougald, M.P., Manager Poole, Dr. Johnstone, and others.

We visited the Acadia colliery. In 1884, this colliery produced 115,451 tons of coal with 47,611 days' labor (194 men and boys), under-ground; and 14,806 days' labor (67 men and boys) on the surface. The average tons per day per miner were 4, the average quantity raised per day was 467 tons. The mine worked 247 days in 1884. The colliery is under the able management of Mr. H. S. Poole, formerly mining inspector for Nova Scotia.

The Drummond mine, of the Intercolonial Coal Company, a Montreal concern named after George A. Drummond, of Montreal, who was originally one of its largest shareholders, has a capital of some $750,000, and is famous all over the continent because of the great explosion of 1873, when sixty-five men and boys were killed and the mine was nearly destroyed by fire. The present workings have reached a depth of 2800 feet, or over half a mile.

The Drummond is ably managed by Mr. Robert Simpson. Several of the ladies went down the shaft—a novelty few ever enjoyed before. During the morning, the mine had been inspected by Mining Engineer Lewis, who accompanies Sir George Elliott, M.P., on his mission to this province. The Drummond is running on full-time, gives employment to 450 men and boys, with a monthly pay-roll of $14,000, and has a daily output of about 600 tons.

In 1884, the Intercolonial Company, with 210 men and boys underground (61,770 days' labor), and 105 on the surface (27,706 days' labor), produced 120,656 tons of coal, or an average of 3 tons per miner a day, and an average of 492 tons output per day worked.

The visitors were entertained at lunch by the General Mining Association. The tables were spread in the carpenter's shop, but the bare walls were hidden behind flags and bunting, and the tables were tastefully arranged and supplied with the best of good things. Sir Charles Elliott presided, and the vice-chairs were occupied by J. B. Moore, of the Vale mine, and J. Rutherford, of the Albion.

The cordial welcome received at Halifax was repeated here in eloquent terms by Sir George Elliott, Manager Poole, and others. Mr. Joseph D. Weeks and William Kent returned the thanks of the excursionists in fitting terms.

In the afternoon, the surface works of the Albion mine were visited. This mine is, next to Spring Hill, the largest producer in Nova Scotia. In 1884, its output was 201,557 tons, with a total force of 705 men and boys, working 268,310 days, an average of 2 tons to the miner a day, and an average output of 730 tons a day worked.

The old locomotive Sampson, the second oldest engine in America, was examined with much interest.

At New Glasgow, we very briefly examined the steel-works, where steel is made from scrap-iron and pig-iron, said to be the only steel-works in Canada ; and the glass-works, which make lamp chimneys, tumblers, wine glasses, etc. Judging from our own experience, we should say that Nova Scotia furnishes an extensive market for the last-named article.

We remained at New Glasgow Friday night, and enjoyed a magnificent reception given us by Mrs. F. D. Laurie, whose courtesy and hospitality will long be remembered by each member of our party.

Saturday morning, we went by special train to Port Mulgrave, on the Straits of Canso. Our party was joined by Mr. E. Gilpin, who by some mad night ride behind a fiery steed, like his London namesake, had overtaken us. The ride from New Glasgow is a very beautiful one, the railroad passing through some of the finest scenery in Nova Scotia. Antigonish, the old Catholic cathedral town, was passed ; and by noon the train drew up alongside the steamboat wharf at Port Mulgrave. Here the steamer Marion and that jolly old tar, George Burchell, were awaiting our arrival, and we were soon started on our trip to Cape Breton. The sail through St. Peter's Bay and Canal, and thence through the great Bras d'Or Lakes, as these inland seas are called, is probably surpassed by no other for the diversity and beauty of the surrounding scenery. As the sun went down that Saturday evening, a light shower of rain began to fall, and in an instant one of the most gorgeous double rainbows it is possible to imagine seemed to spring out of the water and paint the whole southern end of Boullarderie Island in brilliant hues, and thus welcome us to Baddeck, where we landed soon after dark.

During the afternoon a, good deal of mysterious whispering and consultation seemed to be taking place between the ladies of our party, which resulted in a general invitation to all hands to attend an entertainment, to be given by the "artistes" of our party in the parlors of the Telegraph Hotel. A description of this evening's tableaux and entertainment is more than my pen could do justice to, even had I the time. The programme was most varied and entertaining, and every member of our troop proved a star of the first magnitude. To mention any individual actor without naming all, would be invidious ; but I can not pass on without expressing our thanks to Mrs. Torrey for her able management of the whole entertainment.

Sunday was a day of rest for all. The churches were all patronized, more especially that one where the services were carried on in the Gaelic language, and hence incomprehensible to the visitors. The afternoon was passed visiting an Indian encampment near by, where the papooses seemed to be especially attractive to the ladies of our party. In the evening, a sacred concert was given to the Baddeckers by our ladies.

The only thing occurring to mar the quiet pleasure of this day was the receipt by one of our members of a distressing telegram from the Spring Hill excursionists. This elicited a considerable display of thoroughly Christian charity on the part of those to whom the news was privately imparted, and equal amusement to the rest of the party when it was found to be a hoax. Monday morning, after wishing good-by to old Baddeck and our kind entertainers there, we steamed away on the Marion up the great Bras d'Or for the open Atlantic and Sydney. As the ocean was neared, the scenery grew much wilder and the coast bolder and more rocky. This latter characteristic applied equally well to our noble steamer. Most of the ladies, and, if the truth must be said, a considerable number of the gentlemen of our party, paid the customary tribute to Father Neptune. By noon, we were steaming up the beautiful harbor of Sydney. Here, as elsewhere, we met with the most cordial welcome and hospitality, both from the members of the committees and from the private citizens, many of whom threw open their houses to us, and insisted on our partaking of their hospitality rather than go to hotels.

On our arrival at Sydney, we found that the following programme had been arranged for our entertainment :

2.30 P.M.—Excursion by tug from Harrington's wharf to the shipping pier of Victoria mines, thence by rail to the mines. Returning, will arrive at Sydney at five P.M. ; or

2.30 P.M.—Drive to Coxheath copper mines, not working, distance nine miles.

On Tuesday, September 22d, at 8 A.M.—Drive to Louisburg, ruins of old French fortress, distance about 28 miles. Time of excursion, about twelve hours.

10.30 A.M.—Two parties will leave by train of the Sydney & Louisburg Company. At the Reserve mine, the parties will divide, one going by vehicles to Cow Bay District, Gowrie mines, Yeadon's patent fuel machinery, and Block House mines. The other also by vehicles to the mines of Glace Bay District and old French workings at Burnt Head. Returning, parties will rejoin at International mines, leaving thence at four P.M. by train to shipping pier on Sydney harbor and by tug to Harrington's wharf.

On Wednesday, at 11 A.M.—Leave Sydney for North Sydney, thence drive to Sydney mines of General Mining Association.

The steamship Marion will call at North Sydney, leaving at five P.M., for passengers to the Strait of Canso.

Head-quarters at the Sydney Club, of which the privileges have been extended to the members of the Institute.

It is impossible in the space you can allow me to describe the several mines and objects of interest examined by the several parties, or to do justice to the never-ceasing courtesy and boundless hospitality everywhere met with by the members of the Institute. The collations prepared by Mr. McKean, at Glace Bay, and by Mr. Charles Archibald, at Cow Bay, were especially notable.

The visit to Mr. Charles Archibald, Gowrie's Mines, at Cow Bay, was perhaps the most interesting of any, owing to the peculiar faulting of the coal measures near the bottom of their basin, which they are now going through. This fault is different from any yet observed in this district, and the results of the development-work now doing to determine its character and extent will be looked for with extreme interest, not only by the owners, but also by all the colliery engineers in this section.

At these mines, also, we had occasion to see the Yeadon briquette-machine in operation. While not yet fully assured of the financial success of the undertaking down in Cape Breton, still the machine is one of the most practical and simple I have ever yet seen devised for the purpose in this country, or in Belgium or France. It appears to do its work perfectly, taking very little power to run it. The pressure on the bricks is given intermittently by a series of plungers, thus dividing the strains equally all over the main shaft. So far, no sign of weakness has been found on any part of the machine. The present mixture contains 17 per cent of cementing material (pitch), and the finished bricks are tenacious enough to bear any amount of rough handling and tumbling about without breaking.

The trip to Louisburg, made by some of the party, was pronounced most enjoyable, and never to be forgotten. Tuesday evening, an entertainment and ball were tendered us by the citizens of Sydney, which were very delightful to the dancers of our party and to those who were not too much tired out by the exertions of the day.

Wednesday morning, a tremendous gale and rain-storm were raging, but we plucked up courage enough to face them, and after a really lively time crossing the bay, all crowded together in the small cabin of a diminutive ferry-boat, we landed, or rather were blown, on shore, in a generally "demnition moist" condition. One of our party remained out on deck. His baptism was complete. After a visit to an outfitting establishment at North Sydney, this brother was returned to us in a costume not far from a cross between a Western cowboy and a buccaneer. Mr. Brown, the Superintendent of the Sydney mines, had compassion on us, and, notwithstanding wind and rain, took us to his house and treated us all most royally. In the afternoon, carriages were procured, and we all started off for the Little Bras d'Or, where the Marion had taken refuge, and was awaiting our arrival, to convey us back to Port Mulgrave, where we arrived safely Thursday noon. This was practically the end of our trip, although the party held together until we reached Truro again that evening. On Thursday morning, just before our arrival at Port Mulgrave, we held a general meeting, at which appropriate resolutions of thanks for generous hospitality and our cordial welcome were passed.

In conclusion, let me say that this was, with the possible exception of the Colorado meeting, the most extensive and delightful as well as

nstructive, excursion ever undertaken by members of the Institute. Not the least delightful feature of the trip was the pleasant intimacies that resulted between the members themselves. Starting on the trip in many instances, as strangers, we returned as friends, and it is to be hoped that the friendships thus formed may be life-long. S.

OBITUARY.

The coal trade has recently lost by death a number of its most prominent members.

Mr. Frederick Parrish, of Wilkes-Barre, Pennsylvania, whose death was recently announced, was, although a young man, well known as a skillful mining engineer, and was, with his father, Mr. George Parrish, of Wilkes-Barre, Pennsylvania, a large operator. For many years, Mr. Frederick Parrish was engineer of the Lehigh & Wilkes-Barre Coal Company.

Mr. Francis Robinson, of the firm of Haydon & Company, died on September 23d, at the age of seventy-one years. For twenty years, Mr. Robinson was connected with the Spring Mountain Coal Company, whose extensive collieries are situated in the Beaver Meadow basin, near Hazleton, Pennsylvania. Mr. Robinson was one of the most prominent and highly esteemed gentlemen in the coal trade.

Mr. D. T. Moore, whose death on September 23d, at the age of seventy-six years, was noticed in this Journal last week (page 227), was one of the most popular and highly esteemed members of the trade, and his death has called out many sympathizing and appreciative remarks from his hosts of friends.

Dr. Garrett Brodhead Linderman, General Manager of the Bethlehem Iron Company, died at Bethlehem, Pennsylvania, on the 28th ult., of congestion of the brain, aged fifty-six years. Dr. Linderman was graduated from the New York College of Physicians and Surgeons in 1847, and in 1856 married Lucy, daughter of the late Judge Packer. At the time of his death, he was at the head of the Bethlehem Iron Company, President of the Lehigh Valley National Bank, a member of the Board of Control of the Bessemer Steel Companies of the United States, a member of the Board of Directors of the Lehigh Valley Railroad, a senior member of the firm of Linderman & Skeer, and of G. B. Linderman & Co., coal operators; a member of the Board of Trustees of Lehigh University and of St. Luke's Hospital; and chairman of the Wilbur Mining and Manufacturing Company, of Ontario, Canada.

Russian Import Duties.—The *Petersburger Zeitung* pretends to know that it is intended to still further raise the Russian import duties on pig-iron, cast-iron, and iron ore, because the last increase has not proved efficient against foreign competition.

Briquettes in the French Navy.—The greater part of the coal now consumed by the French navy is in the form of briquettes. The same form of fuel is largely used in the merchant service, and is rapidly growing in favor.

The Origin of the Native Iron of Greenland.—Since 1813, pieces of native iron have been brought from Greenland by many explorers, and have, in nearly every case, been ascribed to meteoric origin. Steenstrup, in his third voyage to Greenland (1876–1880), however, found the iron native in a basaltic rock at Asuk, in grains varying from a fraction of a millimeter to eighteen millimeters. It is also found on the western and northern sides of Disko Island, and in other places. This settles beyond a doubt the question of the origin of the Greenland native iron, and the ore may be of great commercial importance in the future.

Aerial Navigation.—In a paper communicated to the Institution of Civil Engineers by Dr. Pole, on Aërial Navigation, an estimate is made of the speed that, on known mechanical principles, ought to be given to balloons by a given power applied. According to the author's formula, if d = maximum diameter in feet, and v = velocity in feet per second, the useful horse-power of the engines applied to the screw-shaft should be $= \frac{0{\cdot}00193\ d^2\ v^3}{7 \times 550}$; or $v^3 = \frac{3850}{0{\cdot}00193\ d^2}$ horse-power. In M. Tissandier's balloon, $d = 30$, the dynamo is said to have given a force motive effective, that is, estimated probably on the screw-shaft, of 1½ horse-power. This should give a velocity of 14·9 feet a second. The velocity attained by M. Tissandier was 13·1 feet a second, the difference being probably attributable to the small size of the screw. In Messrs. Renard and Kreb's balloon $d = 27{\cdot}5$. In the first two experiments, the horse-power exerted on the screw-shaft was = 2·33; this should give 18·3 feet a second, or 12·5 miles an hour, which is also very near what was attained. In the third trial, the horse-power was increased to 3·5, which should produce 21 feet a second, or 14·3 miles an hour; the actual speed was 14·6 mile.

Phosphate in South Carolina.—The *Manufacturers' Record* has an interesting article on the phosphate industry of South Carolina, from which it appears that the total amount of phosphate rock mined in this State since the discovery of these deposits has been as follows:

	Tons.		Tons.
1868-70	20,000	1879	200,000
1871	50,000	1880	190,000
1872	60,000	1881	265,000
1873	90,000	1882	330,000
1874	100,000	1883	355,000
1875	115 000	1884	409,000
1876	135,000		
1877	165,000	Total	2,699,000
1878	210,000		

Of this amount there was—

Of river rock	1,229,170
Of land rock	1,469,830
Total	2,699,000

The total, 2,699,000 tons, represents a value of about $16,000,000. In the amount of capital invested, South Carolina stands second, with Maryland first. New York follows South Carolina.

EUROPEAN MINING NOTES.

Written for the Engineering and Mining Journal by George G. André.

In a recent note, I set out a picture of the British iron trade as it appears from the stand-point of market transactions. The picture was painted in somber colors, the heavy shadows being unrelieved by even a glimmer of light. One of the evils of confining one's self to matters of fact is, that one can not always set off the gay against the grave so as to make the general aspect tolerable; for it not unfrequently happens that there is no gay to set off. This seemed to me the case in the present instance, and I was confirmed in this opinion by the simultaneous lapsing into silence of all the newspaper prophets, who, up to that time, had never ceased to point out the signs of a good time coming. We all looked eagerly for these signs, and though we could not always discern them, we persuaded ourselves they were there. But the good time and its signs seem to have parted company; at any rate, only the signs appeared, and when the prophets ceased from prophesying, I thought that they had in sheer disgust retired from the business. Never was mistake greater. They had merely *reculés pour mieux sauter*. The very next week, they came out stronger than ever. This time, they had certainly discovered the rift in the cloud, and as they gazed into it, the light streamed through and illumined all about them. At least, they said it did (see all last week's papers). This is, no doubt, very good, and ought to be comforting. But the dimensions of that rift being microscopic, there are people who can not see it; and as these have lost faith in their professional seers, they obstinately refuse to believe in the existence of any rift at all. The unbelievers are mostly of a practical turn of mind, and, as I remarked somewhat to the same effect higher up, the contemplation of facts alone is apt to contract one's visual powers. In the face of this state of things, the exceedingly hopeful declarations of the organs of the industry are not to be taken as the expression of the opinions of those who are actively engaged in carrying on that industry.

The labor market in England is becoming more unsettled every day, and signs of coming strife between capital and labor are multiplying in all directions. It seems likely that the coal industry will suffer seriously from this cause when the winter's demand has fairly set in. This is an opportunity for which the men are waiting. The recommendation of the General Wage Committee of the Miners' Conference to demand an advance of wages of no less than 15 per cent has further disturbed the unstable relations between the employers and the employed, and shaken whatever confidence there was in the future Some large bodies of coal miners have publicly expressed their intention of joining in the general agitation for obtaining this advance.

The great strike at the Elswick Works, which was so bravely entered upon a fortnight ago, seems to be on the point of collapsing. If the correspondence to the *Times* is to be believed, the occasion of this quarrel is unique and points to a great social change. Few who have had experience in workshops would have imagined that the ears of the men were growing sensitive to profane language. Yet such is the fact—at least at Elswick. The men presented a written request to the manager to raise their wages. The manager tore up the paper, and while doing so expressed his feelings in terms not sufficiently euphemistic for these refined natures; in fact, the men say he swore. Hence the strike.

The mining exhibition in Glasgow is a most interesting collection of all sorts and conditions of things used in coal-getting. The special value of this collection lies in its completeness. We find in it a full representation of the means and the methods of mining in use in that locality, and see almost at a glance the progress made during the last quarter of a century. This is an advantage possessed by a merely local gathering over an exhibition contributed to from far and near. Judging from the number of Americans one meets within the grounds wherein the exhibits are set out to view, many of those who are now spending their time in Europe, must have made their way up into Scotland for the purpose of visiting this unpretentious show.

Some interesting experiments, having an important bearing on the getting of coal in fiery mines, are now going on in one of the South Wales collieries. Sir F. Abel has invented a blasting cartridge of dynamite, in which a shield of water is interposed between the flame of combustion and the surrounding atmosphere, for the purpose of enabling the miner to safely fire shots where there is some danger of igniting fire-damp or coal-dust when the ordinary means are used. It is this cartridge which is now tried.

The development of the coal industry in Russia proceeds apace. The total output was, in 1873, 1,288,554 tons; in 1877, it had increased to 1,964,468 tons: four years later, it had risen to 3,838,653 tons; and in 1882, it reached 4,143,484 tons. During the last two years, the industry has progressed rapidly, but no statistics of the production of 1884 have yet been published.

Petroleum residue is now burned in locomotives on all the Russian railroads. This form of fuel is likely to be largely used in the future in the place of coal, not only for locomotives, but for steamships.

Some of the German technical journals have recently directed attention to a new process for obtaining metallic magnesium by distillation. The ore, or other substance, containing the metal, is intimately mixed with iron oxide and carbon, or sometimes with carbon alone, and the mixture is raised to a white heat in a closed vessel. The magnesium vapors are condensed and collected in the usual manner.

The Sub-Committee of the Prussian Fire-Damp Commission has issued its report on safety-lamps. This report contains interesting accounts of the investigations made by the committee, and gives much valuable information. Many doubtful points have been cleared up, and some important facts hitherto unobserved have been made known. A more instructive volume on the subject in quesion was never issued.

M. Bourdais, French government architect, and M. Devic, engineer, originators of the scheme of the Universal and International Exhibition to be held at Courbevoie, near Paris, in 1889, are in London endeavoring to enlist the sympathies of English and American exhibitors. They have already had an interview with the Lord Mayor, and have been officially received at the Inventions Exhibition at South Kensington. M. Bourdais's plans cover 500 acres of land. This fact is pressed upon the notice of exhibitors, who in 1878 suffered seriously for want of space.

MODERN AMERICAN METHODS OF COPPER SMELTING.*

By Edward D. Peters, Jr., M.E., M.D.

CHAPTER IX.

THE SMELTING OF COPPER.

It is very evident that such a state of affairs can not be compared with its average American conditions, where, in the greater number of instances, the ore supply comes from only one or two sources, constant in its composition, and usually in very large quantities. This, with the high wages and exceedingly expensive fuel, has caused the introduction of labor-saving machinery and appliances to an unprecedented extent, as well as a constant endeavor to lessen the proportion of fuel to ore smelted. The lack of steady and skilled furnacemen, and the high cost of refractory materials, have also had a powerful influence in shaping the processes of treatment, and have perfected the water-jacketed cupola, without which many of our most successful metallurgical enterprises could hardly exist. The same influences have concentrated the works for the refining of copper in a very few hands, and located them with the view to cheap coal and refractory materials and to a market for the finished product. Another factor that has had its effect in greatly simplifying our domestic process of refining is the extreme purity of the lake copper, which, being until lately the only copper of any importance produced in the United States, has established such a high standard of purity and strength that all copper has been virtually divided into two classes—lake copper, and outside brands—the former bringing from ½ to 1½ cents a pound more than the latter, while the latter has not been subdivided into the various classes of "best selected," "tough cake," etc., etc., as in England, but has brought about the same price, without regard to quality, unless so bad as to be obviously unfit for manufacturing purposes.

BLAST-FURNACE SMELTING.

a. Of sulphide ores.
b. Of ores free from sulphur.

A. TREATMENT OF SULPHIDE ORES.

The fusion of sulphide ores in blast-furnaces may take place either with or without a previous calcination, as has been already referred to.

Where the percentage of sulphur is small in proportion to the copper contents, a sufficiently high-grade matte may be obtained by the direct fusion of the raw ore, with the addition, of course, of the proper quantity of basic substances, such as iron ore, limestone, etc., to flux the very large proportion of gangue rock, which, in most cases, consists of quartz or some highly siliceous substance. As the amount of basic material required to flux silica is very large, about two pounds to one of silica, it is advantageous only under such exceptional circumstances as the possibility of obtaining exceedingly cheap iron ore and limestone, if possible, containing some copper or silver; and also of cheap coke or charcoal. Otherwise, such an ore would be more advantageously treated by one of the wet processes. No better flux for silica can be had than the ferruginous slag arising from the concentration-smelting of copper mattes, which usually contains about one per cent of copper, but can seldom be obtained in such quantities as to form a permanent flux for any considerable amount of highly siliceous ore.

The class of copper ore most commonly subjected to blast-furnace treatment in the Eastern portion of this country is a highly pyritous material, usually having from 2 to 6 per cent of copper, and varying amounts of silica. These are first burned for the manufacture of sulphuric acid, while the cinders are smelted for copper. The ores from Capelton, Province of Quebec; Milan, New Hampshire; Virginia; and Georgia carry an excess of iron, and to them may be added the monosulphide ores found at Ely and Copper Hill, Vermont; Ducktown, Tenn.; and Ore Knob, North Carolina, which, although not treated for sulphur, yet reach the blast-furnace after roasting in the same condition as the first-named ores. In the West, a large number of mines furnish copper ores usually of somewhat greater richness, but in which the silica is in excess, rendering the smelting more difficult, and occasionally making the employment of reverberatory furnaces advisable. To this class belong, also, the Douglas and many other Maine deposits; the St. Genevieve (Mo.) mines; a large class of argentiferous copper mines in San Juan District, Colorado; most of the Butte City veins; and a series of important though little known deposits in Lower California and Nevada. This brief enumeration includes most of the types of ore likely to come to the blast-furnace; and the first object of the metallurgist is to see how he can form a proper slag at the least possible cost. A proper slag for a blast-furnace should contain between 24 and 36 per cent of silica, although, under pressure of circumstances, these extreme figures may be either raised or lowered about 6 per cent without seriously compromising the running of the furnace. But every per cent of silica in excess of 36 will be felt in a rapid reduction of the amount smelted in twenty-four hours.

As it is usually a long time before the young metallurgist fully appreciates the enormous damage that even a slight excess of silica will effect, the writer desires particularly to emphasize this point, and to declare that, according to his own experience, three fourths of the troubles and annoyances experienced by the blast-furnace manager result from this cause. There are many instances of furnaces that have given trouble from the day of their first starting being relieved by a slight addition of iron ore, and smelting operations have changed from a loss to a profit, capacity been increased 40 per cent, and the campaign lengthened from 20 days to several months by slightly increasing the insufficient charge of limestone and iron.

In speaking of modern blast-furnace smelting, we may well omit any lengthy description of the small brick furnaces so familiar to all who look over the illustrations in Kerl and Plattner. The economy of larger furnaces has been thoroughly demonstrated, and in the present treatise, plans and descriptions will be mostly confined to the two principal types of furnace now in use:

1. The water-jacket furnace, with its various modifications.
2. The long rectangular brick furnace.

With a thorough understanding of the construction and management of these two varieties of furnace, the metallurgist is amply prepared to obtain the best results known to modern engineers.

1. The water-jacket furnace, with its various modifications.

Without attempting to determine to whom the credit belongs of adapting the principle of water-cooling to copper blast-furnaces, it may be hailed as the greatest advance in the treatment of that metal that has been made since the introduction of the English method of refining on the hearth of a reverberatory furnace. With its employment, the burning out, and consequent "freezing up," of the furnace from the half-fused masses of molten fire-brick, have become things of the past, and campaigns have been extended to an unprecedented length. In fact, where no accident occurs, nothing compels the stoppage of the furnace excepting the need of general repairs to machinery, etc.; the cleansing of the interior of the jacket from sediment: and the possible choking up of the furnace shaft with accretions of sulphides of zinc or lead, which occur in minute proportions in almost all copper ores.

The material of which the jacket is composed may consist of cast-iron, wrought-iron, or mild steel. The brand of wrought-iron known as fire-box iron is preferred by the author, as less liable to scale and blister by the heat, and capable of being bent without weakening. Where cast-iron is used, the furnace is composed of several sections, held together by clamps or rings; but aside from the excessive weight, this material is somewhat liable to crack when exposed to extreme fluctuations of temperature, although of late, the castings are made from ⅜ to ¾ inch thick with a water-space of from 4 to 10 inches. The thickness of the wrought jackets need not exceed that of ordinary boiler plate, and this material is peculiarly suited to circular furnaces, the inner plate having been found to buckle and weaken, owing to difference of expansion, when used in long rectangular furnaces—an observation made by Mr. J. B. S. Herreshoff, of New York.

Although the circular form possesses certain advantages for smelting-furnaces, experience has taught us that the ordinary blast used in copper smelting, which seldom exceeds ¾ pound per square inch, can not well penetrate to the center of a charge in a furnace of greater diameter than 50 inches, this being the outside limit in cases where at least one half the charge is in lump form. In wrought-iron jackets, the width of the water-space has been diminished little by little, until even 2 inches has become a not uncommon standard, and its reduction over several square feet of surface to 1½ inches has not been accompanied with any evil results. The cold feed-water is generally introduced near the middle or lower portion of the jacket, and doubtless settles to the lower point at once, rising gradually as it becomes heated, and escaping through a pipe of somewhat greater area from the upper portion of the jacket. It is best to have the escape-pipe tapped into the water-space in such a way that it is even with the extreme upper surface, thus preventing the accumulation of any steam that might form. Circulating pipes are introduced into the water-space by some of the best manufacturers; but while not prepared to deny their value, the author has run water-jacketed furnaces of many sizes and shapes, and under varying conditions, and has never felt the need of any guide-plates, the difference in temperature of the incoming and outgoing water always being sufficient to keep up a lively circulation to the most distant point, while any sediment introduced in the water could always be easily removed through the hand-holes provided for that purpose.

The following figures, deduced from personal experience, give the quantity of water required for a furnace of this description when in full blast:

Diameter of furnace, inches.	Gallons water per hour while blowing in and out.	Gallons per hour during normal running.
24	900	460
30	1200	600
36	1450	950
42	2200	1200
48	3000	1500

These figures refer to a supply of fresh water; but where the same water is used over and over again, about 3000 gallons per twenty-four hours is required to make up the loss by evaporation, etc., at a 36-inch furnace in the dry, hot climate of Arizona. Prof. F. L. Bartlett has arranged a tank at such a hight that its upper surface is a trifle higher than the water-level in the jacket, by which means a constant circulation takes place, requiring only the addition of sufficient fresh water to replace the evaporation. This may require a little extraneous aid from a force-pump or steam-jet during the period of blowing in; but in a few hours, when the upper portion of the furnace is cooled down to its normal condition, this arrangement is said to answer every purpose, though the water may from time to time become a little hot and even form a certain amount of steam. To save all calculation, it may be stated that a 2½-inch feed-pipe with a 2¾ discharge-pipe, the former coming from a tank that will give 8 or 10 feet pressure, will give all the water necessary for a 42-inch furnace

Where the hot discharge-water is not used over again, it is economical to employ it for the boiler, or in winter to lead it into some lower tank, or where it may be used for ore concentration purposes, if such a plant is present. The furnace jacket should always be provided with a drain-cock, to empty it when not in blast in cold weather.

While the weight and clumsiness of cast jackets prevent their being made of any great size, so that the first jackets only occupied a narrow circular ring at the level of the tuyeres and for a few inches above, it has become quite customary to extend circular wrought jackets from a point some 10 inches below the tuyeres, to the threshold of the charging-door, at a distance of from 6 to 10 feet. This saves all brick-work, excepting the small amount in the bottom, and the flue on top, by which the gases are conducted to the stack. This flue and upper brick-work are usually supported on light iron columns, the jacket itself being either suspended from the same columns by a ring, or resting on cast legs of its own.

The bottom of the furnace may be constructed in various ways; but in the smelting of roasted pyritic sulphide ores, American practice is pretty unanimous in entirely doing away with the ordinary deep crucible, substituting for it merely a sloping bottom a foot or less below the tuyeres, from which the entire molten material escapes through a narrow groove under the breast, then first entering an outside crucible or "well," in which the matte separates from the slag, and is tapped into molds, while the slag flows from a spout into iron pots arranged on wheels for con-

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venient dumping. It is this transfer of the crucible from the inside to the outside of the furnace that has divested cupola work of most of its terrors. By this simple means, we escape the troublesome chilling over of the metal in the crucible, and the frequent freezing up of the tap-hole, rendering it impossible to empty the furnace without the most laborious and tedious work. The formation of sows and other kindred products is also prevented by the immediate escape of the fused ore from the powerful reducing action of the fuel, as are also the cutting down of the crucible and thinning of its surrounding walls until the metal and slag burst through; and a long list of lesser troubles, familiar to every practical furnace-man.

The advantages gained by modern practice may be partially estimated by comparing the following statement with the results given in succeeding pages of this treatise.

(TO BE CONTINUED.)

COMMERCIAL ELECTROLYSIS.*

By Paget Higgs, LL.D., D.Sc.

(*Continued from page* 219.)

POWER REQUIRED.

In the refining of metals, the mechanical power producing the electric current—for, in present practice, the electric current is always produced by dynamo and magneto-electric machines—is absorbed chiefly in overcoming the resistance of the baths, which resistance depends upon the distance apart of the two electrodes, upon the concentration of the solution of the bath, and upon its temperature. In plating, the power expended in transporting the metal from the anode to the cathode is insignificant; but in refining, the mere weight of metal deposited requires clearly considerable work to be expended. As stated, this amount of work may be made, nearly without limit, almost as small as we please. To calculate the amount, there are required as data the quantity of current in ampères, and the resistance of the baths in ohms; the best resistance of the bath is a matter of economic moment. Now, it is always possible to diminish the resistance of a bath by increasing the surface of the anodes and cathodes. Also, the quantity of current may be diminished for a given production of metal by putting several baths in chain, and by so increasing their surface as to make the total resistance equal to that of the first bath. It is possible, theoretically, thus to refine a ton of copper an hour with the expenditure of only a horse-power of work. But there are two limits—first, the nature of the deposit, which with a current of so small density would be crystalline and not reguline; and secondly, the amount of capital required to be sunk in weight of metal operated upon and in the construction of baths. The work expended is, in fact, only one of the economic considerations, and, when favored by such natural advantages as a fall of water adjacent to the factories, or by the collateral requirements or even large steam-powers for rolling or wire drawing, is then of secondary importance. It would be very easy, notwithstanding the great profits and advantages to be obtained from this method of refining copper, to cause the interest upon the capital sunk to exceed the profit on the work done. If a given quantity of copper is economically refined with the expenditure of a certain power, and it is desired to double this production, maintaining the same expenditure of power, it would require fourfold the quantity of metal to be put under treatment, and this would entail much more than fourfold the expenditure for baths. The limit is reached really much earlier than would appear probable at first sight. Two French authorities Hospitalier and Fontaine, have both pointed out that the limit of economy appears to have been reached with 128 baths in chain. That concentration of solution attended with the best practical results appears from numerous authorities to be a solution of sulphate of copper in water at 16 degrees Beaumé, or 1·1247 specific gravity, which corresponds to 12·42 per cent of $CuSO_4$ or to 18·267 of the crystal. The resistance of a cubic centimeter of this solution, or its specific resistance, is 32 ohms at 20 degrees C. With ordinary commerical sulphates of copper, a specific resistance of

25 ohms corresponds to 1·0744 specific gravity at 20 degrees C.
20 " " " 1·1425 " " " 20 degrees C.
15 " " " 1·1425 " " " 25 degrees C.
1 per cent of sulphuric acid being added.

The distance between the electrodes in refining is rarely less than 2 inches (= 5 cm.), and this comparatively great distance is maintained, in order to avoid all chances of contact between the anodes and cathodes. From the foregoing figures, it is easy to ascertain the resistance of a bath, and it is better to assume a specific resistance of 20 ohms, as purer metal results from this than from a more acid bath. For instance, at Marseilles there are 22 square meters of anode surface per bath, and the anodes are 5 centimeters distant from the cathodes. It is convenient to work in metric measures when dealing with specific resistances; but we may, for practical purposes, take the resistance of a cubic inch of sulphate of copper solution as 8 ohms. There are forty baths; the resistance of a square meter is $\frac{1}{10000}$ of that of 1 square centimeter, or $\frac{20}{10000} = \cdot0020$; therefore the resistance of the whole chain of baths is 0·0184 ohm. At Birmingham, the resistance is 0·2 ohm for the chain of forty-eight baths, and at Hamburg it is for 120 baths 0·1 ohm. From the deposits at these works, it is easy to calculate the quantity of current in each circuit or chain of baths. This at Birmingham is 230 ampères; at Marseilles, 220 ampères; and at Hamburg, 265 ampères. From these currents we deduce that about 1¼ horse-power is used in the baths at Marseilles, about 9¾ horse-power at Hamburg, and about 15 horse-power at Birmingham. The waste works may be represented at about one per cent of the total work for that done on the metallic resistances, and at from 5 to 10 per cent for that due to polarization. We have now only to deal with the actual commercial cost.

COST OF INSTALLATION.

The cost of installation at Elliott's Metal Company, Birmingham, may be assumed for forty-eight baths, each of about one cubic yard capacity, and the work employing a motive-power of 20 horse-power, as at £1724, or £16 10s. per ton of copper refined per year. At Hamburg, this is £3940, or falling to £12 8s. per ton of copper refined per annum, with 120 baths, each of two cubic yards capacity, employing 12 horse-power; and at M. Roux's, at Marseilles, this is £1680, or rising to £18 10s. per ton of copper per annum for forty baths, each of three cubic yards capacity.

VALUE OF METAL UNDER TREATMENT.

The value of the metal under treatment may be taken as at £64 10s. per ton on an average, but this is very variable. At Hamburg, the total weight of metal under treatment is about 122 tons; at about this price; and as the output is about 325 tons yearly, the capital sunk in the metal in the baths represents about £25 a ton. In Marseilles, there is sunk in copper under treatment the value of about 54 tons, representing a capital of nearly £3000 for an annual output of 75 tons. At Birmingham, the quantity of metal under treatment is smaller, only about 10 tons, representing a capital of £650 with an annual output of 100 tons. Per ton of copper refined yearly in these three large works, the capital may thus be distributed:

Place.	Installation.	Metal under treatment.	Cost of works.	Total expenses.
	£ s.	£ s.	£	£ s.
Birmingham	16 10	6 0	6	28 10
Marseilles	18 10	36 8	8	63 0
Hamburg	12 8	24 4	15	51 12

The cost of refining the copper must include interest on capital sunk, the cost of motive-power, that of manipulation, the wear and depreciation of plant, and general expenses. Taking capital at 5 per cent interest, and wear and depreciation at 10 per cent on the purchase price, also assuming a high average price per horse-power for motive-power, as this is obtained in small amount, with labor at 7d. an hour, or at 15s. a day for forty baths and £1 10s. a day for 120 baths, and with general expenses at from 100 to 150 per cent upon the cost of labor, we may calculate the total cost to be made up as follows:

EXPENDITURE PER TON OF COPPER REFINED.

Place.	Interest on capital.	Motive-power.	Depreciation.	Labor.	General expenses.	Total.
	£ s.	£ s. d.	£ s. d.	£ s.	£ s.	£ s.
Birmingham	1 8	7 4 0	1 4 0	2 6	2 6	14 8
Marseilles	3 3	4 10 0	0 14 0	2 17	4 6	15 10
Hamburg	2 11	1 11 6	0 9 6	1 12	1 12	7 16

From these figures, it is easy to see that the cost of refining copper by the electrical way is largely dependent upon the circumstances of the installation, but also that these circumstances are under control to a very great extent. No account has been taken of the precious metals obtained during the process as a by-product, and one that stands as a great advantage of this method of refining. The cost has been calculated upon the basis of pure copper obtained, and although, as compared with ordinary metallurgical treatment, it is high, yet the resulting fine metal is much purer, and its value as an electrical material much higher than any other process has been able to obtain.

(TO BE CONTINUED.)

* From the *Engineer*.

New Uses for Steel.—Eight thousand tons of steel castings are used in the construction of an immense block of bonding warehouses in London. Soft Bessemer steel is now largely used in boiler making, and in a thousand other new directions steel is finding new uses. The iron age is rapidly passing away, and the age of steel has taken its place.

The Swan Safety-Lamp for Miners.—This lamp consists of the lamp proper and a secondary cell battery. The weight of lamp and battery together is 6¾ pounds, the cylindrical case containing the cells measuring 8 by 4 inches. The light given, for twelve hours' use, is equal to half a standard candle; but, by reducing the time of lighting to eight hours, the current may be increased, and a light obtained equivalent to three fourths of a standard candle. A single charge provides for a whole day. Mr. Swan holds that the electric lamp is absolutely safe. If it is neither so light nor so cheap as the ordinary lamp, it is in both respects at least practicable, and the working cost will probably not be more than that of the ordinary lamps. As regards weight, he is not without hope of being able to reduce it. It requires no air; and there are, unfortunately, times after an explosion of fire-damp when the air of a pit is so foul that no oil lamp will burn in it. With a Fleuss apparatus for breathing and the electric safety-lamp, the work of exploration, which can hardly be otherwise accomplished, may be carried on, and this, it is reasonable to hope, will be attended with the saving of life.

The Electrical Energy in the Light of Incandescent Lamps.—An investigation has been made by Herr W. Peukert, at the laboratory of the Technical High School of Hanover, for the purpose of determining how much of the electrical energy supplied to different types of incandescent lamps reappears as light and heat respectively. In these experiments, the heat evolved from the lamps was ascertained by registering the rise in temperature of a weight of water in which they were immersed for a stated time. The photometrical measurements were made by the aid of Von Hefner-Alteneck's normal flame. The illuminating power of the various lamps experemented upon was recorded while they were immersed in water, and also when hanging in air, the loss of light in the former case being from one twenty-fifth to one eighth with different lamps. As the result of Herr Peukert's examination, it appears that in one of Siemens and Halske's 8-candle incandescent lamps, 74 per cent of the total work of the current was lost as heat, while 26 per cent was represented by the light emitted. With Edison's 16-candle lamp, 66 per cent of the current was returned as heat, and 34 per cent as light. In Swan's 30-candle lamp, 72 per cent of the current was transformed into heat, and 28 per cent into light.

HUMID METHOD OF COPPER EXTRACTION.

By Dr. T. Sterry Hunt and James Douglas, Jr.

Humid methods are adapted for the extraction of copper from its ores:

I. When the proportion of copper in the ore is too small to admit of the profitable application of a dry or furnace method. The quantities of reagents employed in dissolving the copper from the ore and precipitating it from the solutions will, in ordinary cases, be in direct proportion to the amount of copper present, so that if the ore is poor in copper the quantity and the cost of the reagents required will be proportionately small. In the dry methods, on the contrary, where the heat of a furnace is required to melt down the ore and separate the copper from the impurities, the amount of fuel employed will be in proportion to the mass of material. Hence, for low-grade ores, especially where fuel is dear, such a mode of treatment becomes more costly than a humid method.

II. When the ore contains injurious elements which can not be got rid of in the smelting-furnace, such as, for instance, arsenic and antimony.

III. When the copper is associated in the ore with other metals economically valuable, which in smelting would pass into the copper or be lost in the slag. Such, for example, are the pyritous ores of Spain. These, after their sulphur has been separated by roasting, might be smelted, but in so doing the silver and gold which they contain would unite with the copper, from which they can not easily be separated, while the large amount of iron present would pass into the slag and become valueless.

Whether a dry or a wet method, and if the latter, which of the many known should be chosen, will depend upon many local conditions. Among these are the cost of fuel (of which but small quantities are required in wet methods), and the cost of the dissolving and precipitating agents, which in some places are very cheap and in others are dear. The character of the ore and its mineral composition are also to be taken into account. Such as contain considerable quantities of carbonates of lime and magnesia cause much waste by consuming the solvent acids used in certain wet methods, and on the other hand these matters may serve as fluxes and facilitate smelting in the furnace.

Every wet method consists of two principal operations: (1) The separation of the copper by solution from the other ingredients of the ore or copper-bearing material; (2) the separation of the dissolved copper from any other substances held in solution, by precipitating it as metal, as dichloride, or as sulphuret. All wet methods may be grouped in two classes:

A. Non-regenerative methods, in which a fresh portion of an agent has to be used to dissolve or to render soluble the copper in each successive charge of ore.

B. Regenerative methods, or those in which the solvent power of the liquid used is restored in one of the later stages of the operation, so that the same liquid is used indefinitely.

A. NON-REGENERATIVE METHODS.—The simplest of all methods of extracting copper comes under this head, namely, that by natural cementation. This depends upon the property which sulphureted ores of copper possess of being converted by oxidation in the air into a sulphate of copper, soluble in water. Such a process is going on naturally in many mines, the waters from which become charged with more or less copper, and the same result is obtained in the slow roasting of sulphureted ores, in which the sulphuret of iron bears a very large proportion to the sulphuret of copper. Such ores, after having been burnt in heaps, give up much of their copper to water, and the copper is recovered from the solution by precipitation upon metallic iron. There are several works in California which treat lean copper ores in this way; but only a limited class of ores permits of the application of this simple method, and the extraction of the copper from even these is at best imperfect.

The most widely used non-regenerative method is that in which the sulphureted ore is roasted with common salt, whereby the copper is converted into a chloride soluble in water. The method is applicable only to highly pyritous ores holding less than four per cent of copper, and is expensive in salt and iron. It is, however, very efficacious where the ores are suitable, and is economical where these materials are cheap.

Other non-regenerative methods, in which acids, etc., are used as solvents of the oxide of copper, are applicable only where such solvents are waste-products, as is the case at the great alkali-works of Great Britain and the continent of Europe.

B. REGENERATIVE METHODS.—A method in which sulphuric acid is used as the solvent, and is regenerated in the act of precipitation, is that which has been perfected and applied by Hartmann, at Vivian's works, in Swansea. The copper from the sulphate is precipitated as sulphide by sulphureted hydrogen, with the generation of an equivalent of free acid for every equivalent of copper precipitated. Many impurities dissolved with the copper are precipitated by the sulphureted hydrogen, and must be eliminated in the subsequent treatment of the sulphide. Twice as much sulphur is theoretically required as in our method, to be presently described, though, practically, the difference is probably not as great.

We introduced, in 1869, a method based on the solvent action of protochloride of iron in conjunction with a brine of common salt. It is applicable to ores containing arsenic and antimony, since neither of these substances is soluble in a neutral solution of the protochloride, and it has proved available for the extraction of copper from naturally and artificially oxidized compounds, whether rich or poor. The dissolved metal is in part as protochloride and in part as dichloride or subchloride of copper. In the precipitation of the copper from the solution by metallic iron, the protochloride of iron is reproduced and the bath fitted for the treatment of fresh ore.

While this method was eminently successful and economical when applied to non-argentiferous copper materials, we found it open to the objection, when treating argentiferous matte or ore, that the strong solution of salt needed to dissolve the dichloride of copper formed in the process dissolved also the silver, which was chloridized at the same time. The silver thus dissolved could not, in the presence of the dichloride of copper, be precipitated by an iodide (Claudet's method); while the protochloride of copper, also present, prevented its precipitation by metallic copper. We overcame this difficulty by reducing the whole of the copper in the solution to dichloride by the injection of sulphurous acid. This produced the desired result, but, of course, rendered the solution acid, and thus unfitted it for use as a solvent of fresh portions of copper ore or matte containing arsenic, which is found in nearly all argentiferous copper ores.

THE NEW DICHLORIDE PROCESS.

To overcome this obstacle, we devised the following novel process, which enables us to produce an absolutely pure copper from the most impure ore or furnace product, while it leaves the silver in the residues ready for extraction by any of the usual methods. This process is based upon the reaction between sulphurous acid and a solution of protochloride of copper, which gives rise to insoluble dichloride, with the elimination of one half the chlorine in the form of chlorhydric acid and the simultaneous formation of sulphuric acid, as expressed in the old notation by the formula,

$$2CuCl + SO_2 + HO = Cu_2Cl + HCl + SO_2.$$

The resulting acid solution, when brought into contact with oxide of copper (cupric oxide), will take up as much copper as it originally held, which may, in its turn, be thrown down by sulphurous acid. In this way, the solution of copper from an oxidized ore, and its precipitation as dichloride, may be continued indefinitely, provided chlorine be supplied each time by a sufficient amount of some soluble chloride.

The solid dichloride, if decomposed by metallic iron, yields metallic copper and protochloride of iron. With milk of lime, it gives dinoxide of copper and chloride of calcium, the chlorine in these compounds being sufficient to chloridize as much more copper.

The entire amount of sulphurous acid required in this process may be obtained from the ordinary sulphureted ores or mattes under treatment (provided said mattes carry less than 40 per cent of copper). The sulphur which these contain is, in all wet or dry methods alike, got rid of by roasting, in the form of sulphurous acid, and the utilization of this in our process involves only the expense of forcing or drawing it through the copper-holding solution.

The chlorine, derived in the first place from the addition of a portion of salt, is used over again by restoring to the solution the protochloride of iron or chloride of calcium got from the dichloride of copper, only so much salt being added from time to time as is necessary to replace the loss in working, which is small if care be taken to save the chloride solutions produced in the precipitation.

The only reagent actually consumed which is not yielded by the ore itself is the iron or the lime used in decomposing the dichloride, and in localities where sulphate of lime and sulphate of iron possess any value, these can be saved as by-products.

In treating argentiferous ores or mattes, the following are the steps of the process:

I. *Grinding.*—Unless the ore be low in copper and very pyritous, it must, in order to thoroughly oxidize it and extract the silver, be ground so as to pass through a screen of from 20 to 30 meshes to the inch. Mattes must always be ground to $\frac{1}{30}$ of an inch. A mill very suitable for grinding mattes is built by the Sturtevant Mill Company, of Boston.

II. *Roasting.*—If the ore to be treated contains over 20 per cent of sulphur, it can be kiln-roasted in lumps, and the sulphurous acid drawn from the kiln will be of sufficient concentration to throw down the copper from a solution.

III. Such lump ore must, however, after the preliminary roast, be again roasted in some suitable furnace. One which has been found to fulfill the double purpose of giving a thorough roast and yielding a pure gas, is a cylinder-furnace with a central flue which conducts the gases from the fire-place, and which radiates heat enough to roast the ore in the annular space between it and the inner wall of the cylinder.

A matte, if not too rich in copper, can be roasted in this furnace, and will yield sufficient sulphurous acid for precipitating its copper; but if the matte contain over fifty per cent of copper, a sulphureted ore must be roasted at the same time in another furnace, to supplement the deficiency of the acid.

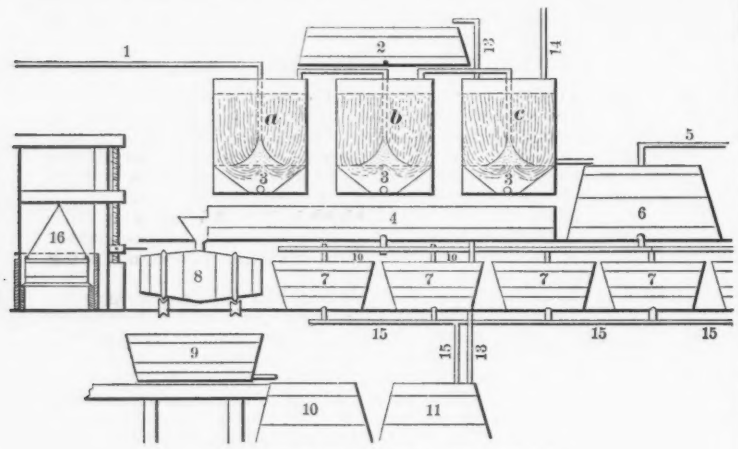
It is necessary that the sulphurous acid gas to be used in separating the copper be not diluted with too much air; otherwise, it is inoperative. The gas from ordinary reverberatory and muffle-furnaces is, from this cause, too weak, but gas from a battery of kilns, if properly handled, or gas from a shelf-furnace, is strong enough.

IV. *Separation of Copper and Regeneration of Solvent.*—The sulphurous acid gas thus obtained, if injected into or drawn through a solution of mixed sulphate and chloride of copper, causes the copper to separate rapidly from the solution as a heavy white precipitate of dichloride. Theoretically, one part by weight of sulphur, burned to sulphurous acid, should separate about four parts of copper, but in practice such results can not be attained. We have found, when simply forcing the gas through a depth of five feet of solution, that one pound of sulphur separates two and one quarter pounds of copper. At the commencement of the operation, no sulphurous acid escapes from the reducing-vat, the large proportion of copper in the solution absorbing it all; but as the copper separates and the solution grows less strong, toward the close of the operation, an increasing quantity of the gas escapes unabsorbed. In cases where there is a large excess of gas available, and where its escape into the atmosphere is not objectionable, the simplest way of applying it is to drive the gas by means of an injector, such as Korting's (manufactured by Schutte & Goehring, Philadelphia), into the solution of copper; but if the sulphurous acid gas must be economized, we would suggest the following form of apparatus, shown in the illustration.

Three air-tight lead-lined vats are coupled together, like Wolff's bottles, the first being connected with the furnace, the last with an aspirator. Vat *a* receives the strong gas, and being provided with a steam-coil, the liquors become speedily hot and the reduction proceeds rapidly. The escaping gas is absorbed by the solution in vats *b* and *c*. That in vat *b* being heated by the gas and steam, is acted on, though slowly, while the cold solution in vat *c* dissolves any sulphurous acid which escapes from vat *b*. When the copper in the solution in vat *a* is sufficiently separated, the current of gas is reversed, vat *c* being connected with the pyrites-burner or furnace, and vat *b* with the aspirator.

Vat *a* can be emptied and again filled while the gas is passing through vats *c* and *b*, thus avoiding interruption to the process. The solution in vat *c* being already partially saturated with sulphurous acid, the reduction of the copper goes on very rapidly. The middle vat of the series can be emptied every two or three runs; the third of the series for the time being is simply a dissolving-vat for the escaping gas. With this form of apparatus, little or no sulphurous acid escapes, but a certain amount is consumed by the excess of air which enters the reducing-vats with it, and which oxidizes part of the sulphurous into sulphuric acid, producing thereby a portion of sulphuric acid.

A steam-jet exhauster will draw a stream of gas through a depth of twelve feet of solution: with an air-pump, a much more perfect vacuum can be obtained and the gas drawn through a greater depth of solution. If, however, vats say of eight feet diameter are filled to the depth of five feet, each vat will hold 2928 gallons of solution. If this contains seven



PLAN OF VATS, TANKS, AND BARREL.

EXPLANATION OF PLAN.

1. Pipe leading from sulphur-burner or furnace.
2. Store tank from which to fill reducing-vats with copper solutions.
3. *a*, *b*, *c*, reducing-vats, *a* being connected with furnace and *c* with exhauster by 14.
4. Tank to receive dichloride from reducing-vats.
6. Tank for acid liquors in which dissolved sulphurous acid and dichloride are oxidized by air forced in through pipe 5.
7. Series of stationary leach-vats with conducting-pipes, 15.
8. Barrel for the treatment of dichloride with iron or milk of lime.
9. Tank for metallic copper from barrel.
10. Tank for protochloride of iron drained from tank 9.
11. Tank for copper liquors from leach-vats, with pipe 13 to store tank, 2.
16. Sectional sketch of movable tray in leach-vat, the tray moved by a screw.

per cent of copper before treatment, and one per cent be left in the acid solution after reduction, 1462 pounds of copper will be deposited in one of the end vats at each operation.

The time occupied in the reduction, emptying, and filling, if the sulphurous acid be abundant and strong, will not exceed three hours. Eight charges can therefore be put through the end vats, and four charges through the middle vats, in a day, each charge yielding 1462 pounds of copper, or a total of say 16,000 pounds of copper daily.

The heavy dichloride of copper, as it forms, settles on the hopper-shaped bottom of the tank, and must be discharged daily, or it will become too solid.

The acid liquors, when the reduction is complete, are colorless, but they will contain from ½ per cent to 1 per cent of copper, most of it dissolved as dichloride. They also contain in solution a certain amount of sulphurous acid gas, which, if admitted to the dissolving-vats, would there form dichloride of copper. After drawing these liquors off from the reducing-vats, therefore, and before again using them, we drive air through the liquors, which oxidizes both the dichloride and the sulphurous acid.

V. *Dissolving Copper from the Ore or Matte.*—Most ores can be leached, the roasted ore being laid to a depth of from one to three feet, according to its fineness and permeability, on a gravel-filter or a perforated false bottom, and then covered with the hot acid liquor, which soon soaks through them. When saturated with copper, the liquor is drawn off and replaced by a further supply, and this is continued till the oxide of copper has been all dissolved. Percolation from below upward is generally more regular than from above downward. If the ore be clayey, or if rich mattes be under treatment, it is better to dissolve the copper by agitation in stirring-tanks than by leaching. When handling rich mattes, the residuum of oxide of iron, after roasting off the sulphur and dissolving the copper, is so small in quantity that it may be allowed to collect in the stirring-tank during the treatment of several charges.

The liquors from the leaching-vats or the stirring-tanks being charged with copper, after receiving a proper proportion of a solution of protochloride of iron or chloride of calcium from operation VI., are conveyed to the reducing-tanks, where, by the action of sulphurous acid, the copper is thrown down as dichloride and the solvent acid is regenerated, rendering the solution fit to take up a fresh charge of copper, and so on indefinitely. The protochloride of iron or chloride of calcium from operation VI. should be collected in tanks of known size. The composition of this solution can, by ordinary care, be made constant, and the copper liquors ought always to be up to a given strength, say 7 per cent of copper. For chloridizing, therefore, a certain bulk of copper liquor, a calculated amount of so many inches in depth of the chloride liquor will need to be drawn from the tank containing it. Exactitude is not required, as a little copper or a little chloride, more or less, in the acid liquors is not lost, but retained in circulation.

VI. *Treatment of the Dichloride of Copper.*—The insoluble dichloride of copper, after being discharged from the reducing-vats, is washed with water to remove the acid liquor with which it is moistened, and which may carry arsenic and other impurities. Thus washed, it is an absolutely pure compound of copper, since the sulphurous acid can separate nothing but copper from the solution.

This solid dichloride must be agitated with scrap-iron of any kind and a sufficiency of water, in a large barrel, if metallic copper is to be produced, or with milk of lime if dinoxide is to be the product. If metallic copper is thus made, there will be a disengagement of hydrogen, caused by some adhering acid, and the barrel must be provided with a valve to be opened mechanically at each revolution and allow of the escape of the gas. The precipitation by milk of lime is almost instantaneous. The precipitate is bulky, and is best collected and pressed into slabs in a filter-press, by which all the chloride liquors can be washed out by the precipitate. The slabs of red dinoxide when dried will be solid enough to be smelted to metallic copper in a cupola-furnace, and such copper will be of great purity.

The solutions of protochloride of iron or of chloride of calcium are preserved for chloridizing the copper solution as above described. Both the cement copper and the dinoxide of copper must be washed clean of chlorides before being smelted. If chloride of calcium be used, when it is added to the copper solution, a crystalline precipitate of sulphate of lime will rapidly form, which should be allowed to subside before transferring the copper solution to the reducing-vats. Being a pure sulphate of lime, it is in many places not without commercial value.

EXTRACTION OF SILVER AND GOLD.

When an argentiferous copper ore or matte is properly roasted, a large proportion of the silver therein contained is, as is well known, converted into sulphate, and if a very small amount of common salt be added in the furnace, the silver is chloridized. In treating such roasted material for the extraction of its copper by the process above described, if care be taken to add to the copper liquor, before the action of the sulphurous acid, no more chloride solution than is necessary to form dichloride with the copper present, the resulting acid liquor will take up none of the silver from the roasted ore or matte. When the removal of the copper has been effected by leaching, the residue containing the silver need not be removed from the leach-vats, but may be treated therein with brine or hyposulphite of soda, or with Russell's compound hyposulphite solvent.* When a material very rich in copper is treated as described, in stirring-vats, the silver becomes concentrated in a small amount of residue.

Thus, a matte containing, when roasted, 60 per cent of copper, will give up to the acid solvent about three quarters of its weight, so that if it contained only 25 ounces of silver to the ton, the residues deprived of copper will not carry less than 100 ounces. Residues containing this amount of silver, and over, should, in localities where salt is not very expensive, be again roasted with salt before being leached or amalgamated, for the extraction of their silver. When gold accompanies the silver, both should be extracted together by amalgamation or by the use of chlorinated brine.

THE PLANT REQUIRED.

The principal parts of the plant are:

1. *Crushing Machinery.*
2. *Roasting-Furnaces.*
3. *Reducing-Vats.*—These may be open lead-lined tanks, into which the gases can be driven by a compressor, but had better be closed, and preferably air-tight, so that the gases may be drawn through the solution by an exhauster. The capacity of such a set of vats has been given above. They should be made of three-inch deals, and lined with heavy lead; the lead being secured to the wooden shell to prevent collapsing.
4. *Leach Tanks.*—These should be lead-lined if possible, and should not be too large; tanks six feet square are to be preferred. If the material is rich in copper, its depth on the filter should not exceed two feet. A layer six by six feet and two feet deep of ground roasted matte will weigh about three or three and one half tons. Several days will be consumed in dissolving the copper from such a charge of rich matte by leaching, while as many hours will suffice to extract it from the same matte if agitated in stirring-tanks.
5. *Store Tanks.*—These—which should be placed, some above the reducing-vats, some between the reducing-vats and the leaching or stirring-tanks, and others to receive the copper liquors from these tanks, and also the chloride liquors from the precipitating vessels—may be open lead-lined tanks.
6. *The Barrel or Cylinder,* in which the dichloride is converted into cement or metallic copper by the action of metallic iron, should have a large diameter in proportion to its length, in order to facilitate the discharge of its solid contents through a port in the bulge. It should be of wood, with a false lining of wood. As the protochloride of iron, which is formed therein, is not of great value, slight leakage is of less importance than from vats holding copper solutions. The barrel may be mounted on trunnions, or, if large, on friction-rollers.

The treatment of the dichloride of copper with milk of lime is most conveniently effected in a stirring-tank. The solid and liquid contents from this can be pumped into the filter-press while the stirrer is in motion.

Lead is the best material for tubes to convey the liquor from tank to tank. Lead-lined pumps should be employed in forcing, and either lead or vulcanite faucets, or rubber connecting-tubes with squeezers, are to be used to control the flow of the liquors.

The size and number of the vats are, of course, regulated by the amount and character of the material to be treated, and their arrangement by the surface of the ground selected as a site.

A properly constructed plant for the application of this or any other wet method of copper extraction is expensive, much more so than a furnace plant of the same capacity, and properly constructed it must be if it is to be economically worked. A wet process should not therefore be thought of unless a sufficiency of suitable ore can be relied upon and unless it is beyond doubt that a wet method is preferable. There are, however, many cases in which solution is the only treatment possible, and many others where valuable amounts of silver and gold are now

* See Russell's Improved Process for the Lixiviation of Silver Ores, by C. A. Stetefeldt, Proceedings American Institute of Mining Engineers, May, 1884.

wasted in furnace products, which could be most economically extracted by a wet process.

COST OF TREATMENT.

The cost of separating copper from lean ores by this method will, in most localities, be less than that of smelting, while a rich ore or a matte can almost everywhere be made into copper more cheaply by fusion than by this or any other wet process. The saving of the precious metals which are found in so many of the copper ores now mined in the West, and the production of a perfectly pure copper, will in most cases, however, counterbalance the slightly greater cost of this process. The greater price which such fine copper commands when compared with impure arsenical copper will, in places where waste sulphurous acid can be used, cover the difference in the cost of treatment between this and ordinary furnace methods.

The elements of cost in this process are :

1. The grinding of the ore.
2. The calcining it, either alone or with the addition of one or two per cent of salt.
3. Labor in the tank-house. This includes filling and emptying tanks, directing the flow of solutions and gases, and handling the solid dichloride and the resulting cement copper or dinoxide of copper. If the plant be systematically arranged, the amount of this labor will be small.
4. The cost of reagents. These are (A) brimstone or pyrites, which must be used as a sort of sulphurous acid when the ore or matte does not contain sulphur enough for its own treatment. In many cases, a pyrites can be got which, while furnishing the required sulphur, will also yield copper enough to pay for its extraction from the residue ; (B) Scrap-iron in the proportion of twelve hundredweight for one ton of metallic copper, or lime in about the same proportion ; (C) Salt to replace loss, which, if care be taken, should not exceed 200 pounds to the ton of copper.
5. The cost of separating gold or silver, or both, from a material which has already been ground, roasted, and deprived of the copper—and which only in the case of very rich silver ores will need to be re-roasted with salt—is very small.

The process here described has been practiced in a small plant at Phœnixville, Pa., where many thousand pounds of fine copper were extracted by it from argentiferous ores and mattes. The copper thus obtained was entirely free from silver and from arsenic. This process has thus passed beyond the experimental stage, and the statements which are here made are based upon our own trials, on a working scale, with the plant just mentioned.

ON THE UTILIZATION OF WASTE ANTHRACITE.*

Prepared for the Engineering and Mining Journal by L. N. Lukens.

Of the coal in our workable anthracite beds, only about from one third to one half is finally utilized as fuel. According to the report of the Second Geological Survey of Pennsylvania, of the coal in the beds worked over in the collieries of the Lehigh Coal and Navigation Company from 1820 to 1881, 40 per cent was left in the ground as pillars, 32 per cent was sent to the culm-bank, and 27 per cent only was sent to market. From January, 1881, to January, 1883, the average was 36 per cent left in the ground ; 24 per cent was sent to the culm-bank ; and 40 per cent was sent to market, the improvement being due to better methods of working. In the Shenandoah District, the "breaker" waste is 27 per cent ; screen waste, 6 per cent ; total, 33 per cent culm. In the Shamokin District, the breaker waste is given as 14 per cent ; screen waste, 6 per cent ; total, 20 per cent. In the Hazleton District, the loss in culm is given as 12 per cent, which is very small, this waste including all that goes through a ⅜-inch screen mesh. It is evident, then, that with the most improved present modes of working there is lost as culm 25 per cent of the amount of coal in the ground and about 40 per cent of the amount of coal brought to the surface.

In 1883, there were 31,000,000 tons of Pennsylvania anthracite brought to market, and therefore, about 20,000,000 tons were lost as slack or culm alone. During the year 1883, the estimated value of anthracite coal at the mines was $2.10 per ton. There was, therefore, the enormous sum of $42,000,000 lost in 1883, as waste coal after mining in the anthracite trade.

The amount of anthracite coal in Pennsylvania—and this is practically all of that fuel in the United States—has been estimated as follows :

DISTRICTS.	Mr. Frank Wilkinson.	Mr. Joseph S. Harris 27 per cent of what is in the ground.	Mr. P. W. Sheafer, 33 per cent of what is in the ground, 1880.	Rothwell's, 40 per cent of what is in the ground, Jan., 1885.
Schuylkill District	1,735,000,000	2,062,386,000	3,768,746,666	2,260,000,000
Lehigh District	80,000,000	282,310,000	1,451,488,000	735,000,000
Wyoming District	1,008,000,000	1,235,340,000	3,036,624,000	1,390,000,000
Total	2,823,000,000	3,580,036,000	8,286,858,666	4,385,000,000

Mr. Wilkinson thinks that, with 30,000,000 tons a year marketed, anthracite will be a luxury too expensive for the poor within forty years. Mr. P. W. Sheafer thought, in 1882, that the middle coal-fields would cease to be profitably mined in eighteen years, or in the year 1900. If the present proportion of waste is to continue in the future, the enormous amount can be appreciated from these figures.

The following are the average screen mesh openings for the smaller sizes of anthracite as now prepared :

	Over	Through
Pea	⅜″ to 5/16″	5/16″ to ⅞″
Buckwheat	3-16″ to ⅜″	⅜″ to 5/16″
Slack	.....	3-16″ to ⅜″

* The material contained in the following article was collected for my graduating theses, Stevens Institute of Technology, etc.

The various methods may be divided into four general classes, namely :

I. Anthracite coke.
II. Artificial fuel proper.
III. Pulverized fuel.
IV. Direct burning processes.

These classes will be taken up in their order.

MANUFACTURING ANTHRACITE COKE IN SOUTH WALES.

The materials are broken and thoroughly mixed in the following proportions : Anthracite culm, ·60 per cent ; bituminous slack, ·35 per cent ; pitch, ·05 per cent.

This mixing is done in a Carr disintegrator, and is then coked in ovens. These ovens are 15 feet long, 5 feet 7 inches wide at the back, 6 feet 2 inches wide at the front, and 4 feet 4 inches high. Each oven is charged with about 4 tons of this crushed mixture, and covered with about two inches of bituminous slack, to prevent the pitch from burning away. Its use appears to be essential. The coking is conducted as with ordinary bituminous coal. The yield is about 80 per cent of the coal charged. The coke is harder and more dense, the finer the materials are crushed and the more thoroughly they are mixed. The coke is steel-gray in color, and very hard. It does not decrepitate. It is about 23 per cent heavier than that made from Welsh bituminous coal.

In a small foundry cupola requiring one pound of ordinary coke to melt ten pounds of iron, one pound of anthracite coke melted 16 pounds of iron. In a blast-furnace working on spiegeleisen, it carried 28½ per cent more burden than ordinary coke. The Landore Siemens Steel Company, in a blast-furnace 65 feet high by 17 feet in the bosh, making 300 tons of pig-iron a week, used 2 tons of ore and 18 cwt. anthracite coke per ton of pig. The same furnace, using best Glamorgan coke, required 27 cwt. of coke per ton of iron. The following analyses are given :

	Ordinary Welsh coke.	Anthracite coke.
Carbon	89·58	94·63
Hydrogen	·44	·30
Oxygen and nitrogen	1·92	1·48
Sulphur	·38	·23
Ash	7·68	3·36

AMERICAN EXPERIMENTS WITH ANTHRACITE COKE.

In consequence of the good results obtained at the Landore Works, the Second Geological Survey of Pennsylvania* made some experiments on the subject, and gave the following statement of results : "Both the laboratory experiments and those in the Belgian ovens show that the pitch is of little, if any, consequence, and can be entirely dispensed with." "A coke can be made from anthracite and bituminous slack which will answer for the uses to which bituminous coke is usually applied." "A coke made of 50 per cent anthracite and 50 per cent bituminous slack, coked forty-eight hours in a 30-inch Belgian coking-oven, produced a fuel which is capable of bearing the burden of a 75-foot furnace-stack. A coke made with 50 per cent Lykens Valley anthracite and 50 per cent Connellsville bituminous made a coke that was firm, coherent, and better than any previously made."

This was tested in a foundry cupola of the Cambria Iron Company, and the following report was made :

Tests made at the Cambria Iron Company's Foundry. Comparative value of Connellsville coke and anthracite coke : "The usual practice on the cupola used for this experiment, when using Connellsville fuel, was : Coke for bed, 1000 pounds ; coke for charge, 176 pounds ; iron, 1500 pounds ; speed of melting, 5 tons per hour. When using anthracite coke, the practice was : Coke for bed, 1400 pounds ; coke for charge, 220 pounds, iron, 1500 pounds : speed of melting, 3½ tons per hour.

"1st trial. Used two charges of anthracite on last run of cupola. Iron dull. Apparently much cinder.

"2d trial. Three charges of anthracite on last run of cupola. Iron 'lived well,' and retained its fluidity.

"3d trial. Four charges of anthracite last ran of cupola. Indications of slow melting toward last.

"4th trial. 1400 pounds anthracite for bed, and 1760 pounds for eight charges = 220 per charge with 12,000 pounds iron. Iron hot ; melting slowly ; first hour, 3 tons—second hour, 3½ tons ; seemed to crush badly and throw off many more sparks than usual with Connellsville.

"The above indicates a lower melting capacity and more time necessary to do the same work. However, this does not prove that better results may not be obtained by further test.

"Another feature is, that it crumbles badly in handling. Also seems to leave a cinder in cupola very hard to separate from the brick when cleaning. (Signed) DANIEL JONES."

This is commented upon as follows :

"The above statement requires no elaboration, and it needs only to repeat that, as compared with Connellsville coke, the anthracite coke has a lower melting capacity, requires more time to do the same work, and crumbles badly in handling."

EXPERIMENTS DEFECTIVE AND INCONCLUSIVE.

In view of the discrepancy between these two reports on the same subject, and the probably great influence of the Pennsylvania Survey report in discouraging further practical trials, I have tried to examine into the cause of the disagreement.

And first, there is a contradiction in the Pennsylvania report itself. On page 393, it states that, from an examination of the physical and chemical properties, it is shown that a fuel can be made from anthracite and bituminous slack coals that will answer for the uses to which the bituminous coke is usually applied, and that the anthracite coke is capable of bearing the burden of a 75-foot stack ; while on page 398, after Mr. Jones's experiment, it states that, "If the material made at the Johnstown ovens be a fair sample of what might be expected as the average product—and the record of the charges as given above is evidence that much care was exercised—the conglomerate fuel could not compete at present either with coke or with anthracite coal."

Now, here are two diametrically opposite conclusions drawn by the writer of the report himself.

* Report, Vol. MM, page 382.

The analyses of anthracite culm and bituminous slack used and coke produced are as follows:

	Lykens Valley coal. (A. S. McCreath.)	Swansea anthracite.	Connellsville coal. (A. S. McCreath.)	Welsh bituminous. (Ure's Dictionary.)
Water at 225 degrees	1·930	And H_2O	·950	
Volatile matter	7·253	7·50	29·662	23·800
Fixed carbon	82·019	89·00	55 901	Coke, 76·900
Sulphur	·525		1·931	
Ash	8·273	3·50	11·556	2·100
	100·000	100·000	100·000	100·000

The volatile matter in the Welsh coal includes every thing that could be driven off by heat.

	American anthracite coke. (A. S. McCreath.)	Welsh anthracite coke.	American bituminous coke.* (D. McCreath.)	Ordinary English coke.
Water at 225 degrees	·250	·30†	·350	·44†
Volatile matter	·490	1·48‡	·930	1·92§
Fixed carbon	88·420	94·63	86·136	89·58
Sulphur	·855	·23	1·824	·38
Ash	9·985	3·36	10·760	7·68
	100·000	100·000	100·000	100·000

These analyses, not being made in the same manner, are not comparable in regard to water and volatile matter. The carbon and ash, however, are the points to be considered.

The charges made against the American anthracite coke are:

1st. Lower melting capacity. 2d. Requires more time to do the work. 3d. Crumbles badly in handling.‖

As far as shown by the analyses, the anthracite coke is the better, containing more fixed carbon and less water, sulphur, and ash. The "lower melting capacity," therefore, only means that it was not properly burned. As shown by various published letters and papers, an open-grained, cellular coke is much preferred at the Cambria Iron-Works. One of the advantages claimed for the Welsh coke was its density of structure. It seems highly probable, at least, that Mr. Jones's unfavorable report was caused by ignorance of the best method of burning the coke, and that, had it been tried in an anthracite-burning cupola or furnace, it would have shown a very different result. It is very certain, at least, that the anthracite coke was much nearer in structure to anthracite coal than to an open-grained coke.

The second charge is a direct outcome of the first. If the temperature was lower, it of course took more time to melt the iron.

The third charge was, that the coke crumbled badly in handling. This was probably due to the want of a thorough mixing of the materials, it being stated in the Welsh report that the finer the materials were ground, and the more thoroughly they were mixed, the stronger and more dense the coke. This density would be no objection in works accustomed to burn anthracite coal, however it might be in the Connellsville region.

In view of these facts, the Pennsylvania Geological Survey's almost unqualified condemnation can not be accepted, and the case still stands open; and it is to be hoped that a thorough trial may soon be made by some one accustomed to using anthracite coal in iron metallurgy.

ARTIFICIAL FUEL PROPER.

The idea of making an artificial fuel by using some cementing substance is a very old one, and has been extensively applied in England, France, and Belgium, one establishment in France making 200,000 tons annually at a cost of 17 francs = $3.40 per ton. The machinery for making this bituminous fuel has been so often and so thoroughly described, that I shall not enter into it very largely. The first English patent in connection with fuel was taken out in 1773. In 1799, the first patent for an artificial fuel was recorded. In 1821, tar was used as a cement. From that time on, a great many patents have been taken out, some of them being of the most ridiculous nature, but all resembling each other in some particular. The various cements fall into two main classes, in one of which pitch in some form is used, and in the other some siliceous substance. All other things being equal, the pitch would have the advantage.

For a very interesting account of these early patents, see the volume on *Fuel*, in Van Nostrand's Science Series.

Although clay, various forms of silica, such as silicate of soda or soluble glass, glue, etc., have been tried as the binding material, the cement almost universally used is coal-tar pitch. This is formed by the distillation of the coal-tar formed at gas-works, etc.

An analysis of good hard pitch gave the following:

Carbon	75·32 per cent.
Hydrogen	8·19 " "
Oxygen	16·06 " "
Ash	·43 " "
	100·00
Specific gravity	1·30

The manufacturers of patent fuel in Belgium use the softest pitch. In England, the medium quality is used. Mr. Loiseau uses the hard, mixing in with 10 per cent of crude coal-tar. On account of the value of the volatile matter distilled, the harder pitch is the cheaper.

THE WELSH PROCESS.

On account of the fact that the French coals are almost all bituminous, the process used by the Atlantic Patent Fuel Company, of Swansea, South Wales, will be described, as representing more nearly the conditions met with in this country.

The process is as follows: The culm, as brought from the mines, is screened, the pieces that will not pass the screen are crushed, and the whole falls into a hopper. The pitch is passed through a disintegrator, and elevated into a hopper alongside of the coal. Both materials then pass through a measure and fall into a large disintegrator, which mixes and reduces all to the size of coarse sand. The mixture is then transferred to a pug-mill and heated by steam. The presses consist of circular tables with square molds, which are filled as they pass under the pug-mill. As the table revolves, it makes a stoppage when the full mold has come under the pressure-plate, the stamp is lifted by steam, and a pressure of about 700 pounds to the square inch is given. The percentage of pitch is about 10, but is varied according to the quality of the coal. Heath & Co., of Cardiff, heat the mixture with hot air, and thus avoid introducing any moisture into fuel.

The following report of tests is given:

Trials made by Taff Vale Railroad. Trial A. Average of Heath & Co.'s ordinary "Star" fuel, taken from a cargo loading at the time. Trial B. Average of best Welsh steam coal:

	—A—		—B—	
Temperature of feed-water	37°	Fahr.	49·8°	Fahr.
Pressure of steam	127	pounds	124	pounds
Mean load, exclusive of engine	295·12	tons	480·70	tons
Average speed in miles per hour	8·98		14·70	
Distance run, miles per day	53·06		78·26	
Pounds of fuel per mile run	35·84		47·61	
Total fuel used	1901·67		3725·96	
Pounds of fuel consumed per mile per ton	·123		·128	
Pounds of water evaporated per pound fuel	10·07		7·62	

The report does not say whether this evaporation is from and at 212 degrees or not, but it probably is so reduced.

The specific gravity of the "Star" fuel is 1·16. The weight of each block is 20 pounds.

The analysis of the "Crown" fuel, as given by Mr. J. W. Thomas, F.C.S., of Cardiff, is as follows:

ULTIMATE ANALYSIS.

Carbon	87·16
Hydrogen	4·16
Oxygen	1·69
Nitrogen	·87
Sulphur	·73
Ash	4·55
Water at 212 degrees	·84
	100·00

Nature of the fuel, semi-bituminous. The evaporative power of the fuel, as determined in a Thompson calorimeter, is 13·36 pounds of water per pound of fuel. Specific gravity, 1·178.

No analysis of the coal from which it was made was sent me. The fact that the fuel was semi-bituminous after the addition of from 7 to 10 per cent of coal-tar pitch shows, however, that the coal must have been a soft anthracite.

These South Wales fuels are very much alike, and these figures made up from different fuels may be taken as a sample of all.

(TO BE CONTINUED.)

A NEW FORM OF CUPOLA FURNACE.*

By Mr. James Riley.

The cupola furnace which I have to submit to the members of the Institute is the outcome of an earnest desire to shorten the duration of the operations necessary in making open hearth steel. These operations may be divided as follows, taking for illustration a charge for soft steel of 12 tons (say 9 tons of pig-iron with 3 tons of steel scrap, and working with ore): Charging, one hour; melting, from three to four hours; boiling and finishing, six hours; repairing furnace, about half an hour.

Looking at these operations with the view of reducing the cost, one naturally asks, Can you not shorten the time occupied in charging, and reduce its cost in labor, by substituting machinery for manual labor? I know that others besides myself have given a good deal of thought to this matter, but probably with the same result, that no contrivance yet hit upon for charging solid material is cheaper than manual labor. But if our considerations turn in the direction of charging fluid metal, it will be at once apparent that this can be done in a very small fraction of the time now taken up, and with the very important advantage that we avoid the cooling down of the furnace due to the long operation and to the furnace-doors being open the while. By these means, we should have a gain of nearly 10 per cent of time—equal to one charge more a week—as well as a considerable saving in fuel and repairs. Arrived at this point, it seems natural that we should look for an additional and a much greater saving than that just mentioned; for surely by charging fluid metal we must save three or four hours usually occupied in melting. Under this conviction, or with the view of determining whether this assumption was correct, Mr. Hackney many years ago tried at Landore the experiment of pre-melting the pig-iron in a cupola, whence the fluid charge was readily and quickly transferred to the melting-furnaces. He has somewhere published the result, which was an almost inappreciable reduction of the time usually taken up in working the solid charge. At the instance, and to satisfy the directors, of the Steel Company of Scotland, immediately after I came to Glasgow, I had two melting-furnaces worked for a week with fluid charges obtained by pre-melting the pig-iron in the foundry cupola. In estimating the result, we concluded that there was a doubtful gain of a quarter of an hour per charge, obtained at the expense of the coke and labor expended at the cupola. The explanation of the discrepancy between the expected and the actual result is known to many, but may nevertheless be briefly stated.

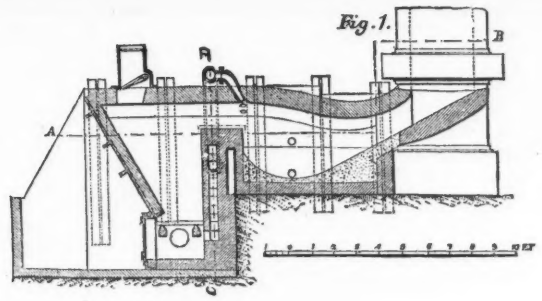
During the melting of a charge in an open-hearth furnace, a large proportion of the silicon and carbon is removed, leaving little more than half the carbon to eliminate in the subsequent operations. Now, in the case of the fluid charge, which has been pre-melted with coke in the cupola, these changes have not taken place, and the time required to remove the impurities from the fluid metal, after being charged in the open-hearth furnace, is almost as long as that required to melt and purify the solid charge.

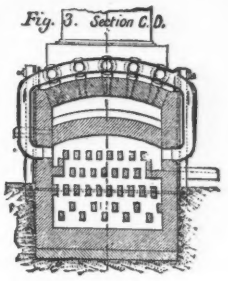
Long ago, it occurred to me that, if I could substitute gaseous for solid fuel in melting in the cupola, I might be able to alter the conditions and accomplish the much desired end. About eighteen months ago, I determined to try whether this could not be done, and accordingly got out designs for a cupola, which, however, seemed unsatisfactory in one or two parts.

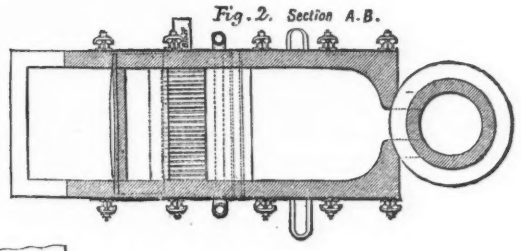
Some time later, I discussed the matter with my friend Mr. Crossley,

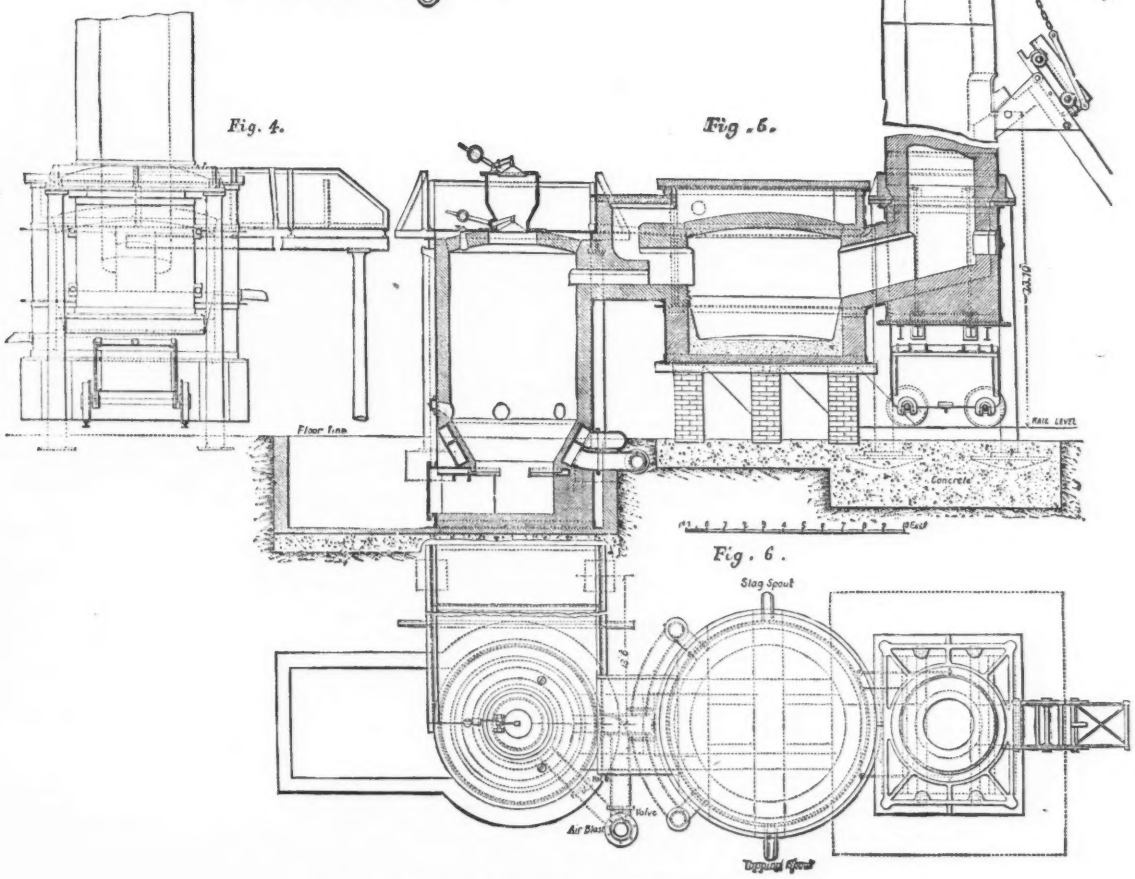
* Pennsylvania Geological Report, MM, 109. † Hydrogen. ‡ Oxygen and nitrogen. § Oxygen and hydrogen. ‖ Report, page 397.

*A paper read before the Iron and Steel Institute at Glasgow. The illustrations copied from *Engineering*.









A NEW FORM OF CUPOLA FURNACE.

with the result that we modified the designs to pretty much what I now submit to you. The diagrams before you show two types of the cupola furnace, similar in principle, although differing in form. Figs. 1 to 3 show the fire-place or gas generator and the furnace body of a rectangular form in plan. In Figs. 4 to 6, the furnace is circular in plan, with a gas generator also of circular horizontal section.

In both cases, the gas generator has a closed grate and is dependent upon forced blast—obtained from an ordinary blower—for supporting combustion in the production of gas from the coal, which is charged in at the top in the customary manner.

In like manner, the air for supporting combustion in the body of the furnace is obtained from the blower, and in the case of No. 1 is passed through the pipes or nozzles placed transversely across the body of the furnace, almost directly over the bridge that divides the generator and furnace. These pipes are inclined so as to direct the flame down upon the bath of metal held in the hearth of the furnace. In this design, the air for combustion is heated in the passages in the back wall of the generator, through which it is sent to the nozzles above referred to. In No. 2, the air for combustion passes twice around the hearth of the generator, in the pipes shown in the figure, thence to the crown of the furnace body, whence—being thoroughly heated—it emerges by the air-port directly over the gas-port leading into the furnace and to the cupola; and in addition, we can, if desired, turn this heated blast through the nozzles inserted in the sides of the furnace hearth as shown.

The cupola is of ordinary foundry type, of nearly equal dimensions from the bottom to the charging-hole, which is at about the usual hight from the hearth. It is in two parts, the lower being removable, and the upper supported on pillars as shown. The hearth has a slight downward inclination, to allow of the molten metal flowing readily into the furnace body. The hearth of the cupola is arranged so that it can be easily removed for repair, and another substituted when necessary.

This hearth-piece and the furnace body may be lined with either basic or acid material, as may be most suitable to the pig-iron, etc., being melted and treated; for, besides melting, we are of opinion that, with a basic lining and necessary mixtures and arrangements, we shall be able to remove the phosphorus in the hearth of the furnace. If we can accomplish this, then we shall be able to melt common iron in the basic-lined cupola, remove the phosphorus, and afterward finish the charge in the acid-lined open-hearth furnaces. With the permission of my directors, Mr. Dick, manager of the Blochairn Works, made a tentative experiment with a kind of improvised furnace and gas generator, very similar to Fig. 1, conjoined to a small foundry cupola. The furnace having been heated, pig-iron was charged into the cupola through the ordinary charging-hole—about 12 feet above the hearth—tumbling it in upon the hearth, and filling up to near the charging level. The blast was then turned on from the Roots blower, ordinarily used for blowing the cupola, and after about two hours' blowing we had the satisfaction of seeing the metal begin to melt and run down into the hearth, whence it was shortly afterward tapped into the ordinary foundry ladle and run into castings. The experiment was continued long enough to indicate a few weak points in our apparatus, and also to remove some lingering doubts of the possibility of success. One or two more short trials having been made, I was anxious to make a more lengthened one—long enough, in fact, to furnish reliable data for action upon a large scale. Accordingly, we heated up

the furnace on Monday, put on blast on Tuesday morning, and worked almost without intermission night and day until the following Saturday. After some days' work in melting pig-iron, finding that every thing was satisfactory, and that we had a very high temperature in the furnace, I determined to try to melt the steel scrap that would ordinarily be charged into the steel furnace. Commencing with the addition of 10 per cent of scrap, the proportions of pig and scrap were very gradually changed, until, at the termination of our experiment, we were melting charges in which the proportions were six of steel scrap to one of pig-iron.

Our operations were stopped by the failure of the furnace lining, which, being only ordinarily good fire-brick, could not successfully resist the high temperature to which it was exposed.

At the earlier stages of the experiment, when melting pig-iron alone, as much as possible was made into castings, which were very satisfactory, being tough and clean. Analysis showed that we had removed 1 per cent of the silicon and ½ per cent of the carbon. Subsequently, by admitting more air into the furnace, and when melting steel scrap, the silicon was reduced to 0·396, and the carbon to under 1·0 per cent; so that we may conclude that, when the fluid metal can be charged into the open-hearth furnace, the time required for its conversion into mild steel will be very greatly shortened. As these trials were made at a considerable distance from the steel-melting furnaces, and we were unable to transfer the metal from the cupola to the latter, I am not in a position to support this opinion by facts; but we are so satisfied on the point that we are now erecting a large cupola furnace near to the steel-melting furnaces, and I hope very shortly to have it in full operation. In the small experimental trials, we melted at the rate of close on two tons an hour; in the large one, we expect to put through double this quantity, or sufficient to supply four 12-ton melting-furnaces as at present charged; but as we expect to save about half the time of the operations in the latter, and that two furnaces will thus require the same weight of charge as is now taken by four, our cupola is placed midway between two of them, and at such an elevation that, when it is tapped, the metal shall flow directly into either of the melting-furnaces.

The cupola is erecting to the designs shown in Figs. 4 to 6. The pig and scrap will be placed directly from the wagons on to the charging-carriage at the foot of the incline, up which it will be raised and tipped into the charging-hole. The charging apparatus is one that was designed by Messrs. Westray & Copeland, of Barrow, and has been in use at their works for several years. We are erecting a gas generator in connection with the cupola for two reasons: first, because we have no surplus supply of gas available at the works; and next, because I am not sure that we should obtain as satisfactory results when using cold gas from our mains as when it is passed hot from the generator directly into the furnace.

On the important point of consumption of fuel in melting, we were abundantly satisfied: for the coal charged into the generator during the about nine shifts' work only averaged about 1·44 cwt. to the ton of metal charged into the cupola, thus surpassing the most economical cupola working that has come under our notice. On the results we obtained, we think we are justified in believing that, besides its adaptability to the end I had in view in commencing these trials, this furnace is also extremely well fitted for extensive iron foundry practice, where continuous melting is required, and also, and more especially, to Bessemer steel-works, where fluid metal is not available; and I may state that, as the flame can be made to a large extent oxidizing or reducing at will, the composition of the metal need not be changed during melting, the silicon, etc., necessary in the Bessemer operation remaining therefore untouched.

HELLHOFFITE.

Comparative trials, says *Iron*, have been made at St. Petersburg respecting the explosive effects of ordinary gunpowder, nitro-glycerine, and a new explosive known as hellhoffite. The latter, which has been recently invented by Hellhoff & Gruson, is a solution of a nitrated organic combination (naphthalene, phenol, benzine, etc.) in fuming nitric acid. In preparing the hellhoffite tried in the experiments, binitrobenzine, a solid, inexplosive, and badly burning substance, was used. At the first trial, glass bottles of 20 cubic centimeters contents each were filled with 25 grams of the respective explosive substances, and corked down. A tube filled with fulminate of mercury was passed through the corks, a slow-match being attached to the outer end of the tube for the purpose of ignition. Each of the bottles thus prepared was placed on a truncated cone of lead, the upper diameter of which was 3·5, its lower 4·5, and its hight 6 centimeters. The cone itself stood on a cast-iron plate 2·5 centimeters thick. The deformation of the leaden cone by the action of the explosives could consequently be taken as a measure of their respective destructive power. The explosion of the gunpowder, as was anticipated, caused no change. By the explosion of the nitro-glycerine, the cone was compressed about a quarter of its hight; its surface had assumed the appearance of a well-worn hammer. The diameter of the surface had been increased to 5·5 centimeters. The explosion of the hellhoffite caused much greater changes. The surface of the cone was completely torn; pieces 5 centimeters long, and 2 centimeters thick, were torn off and thrown about for several paces; only half of the cone was still a compact but entirely defaced mass. At the second experiment, bottles (of 25 grams each) filled with the various explosive substances were let into corresponding cavities bored into the face of fire blocks of similar dimensions. In exploding the gunpowder, the block was torn into four pieces, as if split with a hatchet; the several pieces were thrown about for 18, 12, 11, and 10 paces. In exploding the nitro-glycerine, the block was split into several pieces. The upper portion of the block, as far as the bottle was let into it, was torn off perpendicularly in the direction of the fiber in such a manner that a smooth cut was formed. The explosion of the hellhoffite likewise tore the portion of the block surrounding the bottle perpendicularly in the direction of the fiber, and splintered the remainder of the block into a large number of thin fibers. The following experiments were also made with hellhoffite alone: A slow-match was passed through the tube in the cork without fulminate of mercury as far as the surface of the hellhoffite in the glass bottle; no explosion followed on igniting the slow-match. A quantity of hellhoffite poured into a bowl could not be exploded by a lighted match. Finally, a few drops of hellhoffite were poured on an anvil and exposed to heavy blows with a hammer, and no explosion followed. The hellhoffite consequently possesses the following advantages: (1) In igniting it with fulminate of mercury, it acts more powerfully than nitro-glycerine. (2) It may be stored and transported with perfect safety as regards concussion, as it can not be exploded either by a blow or a shock, nor by an open flame. On the other hand, it has the following disadvantages: (1) Hellhoffite is a liquid. (2) The fuming nitric acid contained in hellhoffite is of such a volatile nature that it can be stored only in perfectly closed vessels. (3) Hellhoffite is rendered completely inexplosive by being mixed with water, and can consequently not be employed for works under water. It would, therefore, be injuriously affected by exposure to damp, and, moreover, there are no records of its behavior under extremes of temperature. Without some experiments in this direction, in our opinion, all the rest are comparatively valueless.

South African Diamonds.—Rough and unpolished diamonds to the value of $3,065,375 were exported from Kimberley, South Africa, in June.

Apatite Mines in Sweden.—From Stockholm, Sweden, it is reported that the apatite mines in the Gellivara District are exceedingly rich, the mineral being of excellent quality.

Tin Plates from the Bessemer Converter.—Sir Henry Bessemer proposes the rolling and tinning of tin plates as the steel comes from the Bessemer converter; and a steel plate a mile long may be shown to be of practical attainment.

Minerals in Central Asia.—The Russian government is determined, says London *Engineering*, to leave no stone unturned to develop to the utmost the resources of the region that it has recently conquered from the Turcomans. It has dispatched to Askabad one of the foremost mining authorities of the day in Russia, M. Gulishambaroff, to investigate the mineral treasures of the region. Gulishambaroff is the chief Russian writer on petroleum, and he is also well skilled in mineralogy generally; and although petroleum will be one of the products that he will have to report upon in the newly annexed region, there are others that will attract on his part greater attention still. One of these is sulphur, of which such enormous deposits have recently been discovered in the Turcoman desert that they are probably the largest of the kind in Asia. Iron also is known to abound in many parts of the Akhal oasis, in which Askabad is situated; specimens of a very fine ore having been collected by the mining engineer Konshin, during one of his journeys. Gulishambaroff, who will be well furnished with funds and a suitable staff, will no doubt make other discoveries; for the Herat District, which is contiguous with the territory acquired this year, is particularly rich in almost every kind of mineral. This fact would appear to be unknown to those politicians who counsel resigning Afghanistan to Russia, but we may be sure Russia is well aware of it.

BOOKS RECEIVED.

[In sending books for notice, will publishers, for their own sake and for that of book-buyers, give the retail price?]

West's Moulders' Text-Book: Being Part II. of American Foundry Practice. Presenting Original Methods and Rules for Obtaining Good, Sound, Clean Castings; and Giving Detailed Description for Making Molds Requiring Skill and Experience. Also containing a Practical Treatise upon the Construction of Cranes and Cupolas, and the Melting of Iron and Scrap-Steel in Iron Foundries. By Thomas D. West, Practical Iron Moulder and Foundry Foreman, Member of the American Society of Mechanical Engineers, and of the Civil Engineers' Club of Cleveland, Ohio. Fully Illustrated. New York: John Wiley & Sons. 1885. 12mo, pages viii+461 (including Index) and 147 illustrations. $2.50.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

The following is a list of the patents relating to mining, metallurgy, and kindred subjects, issued by the United States Patent-Office.

GRANTED SEPTEMBER 22D, 1885.

326,543. Rotary Engine or Pump. Charles H. Cary, Bristol, R. I., Assignor of three fourths to Russell D. Bullock, William T. C. Wardwell, Samuel P. Colt, Patrick Hammill, and Eliphalet Horton, all of same place.
326,547. Boiler-Furnace. John Collis, Des Moines, Iowa.
326,557. Machine for Forming Clamps in Sheets of Metal. George Hayes, New York City.
326,588. Forge. Hiram W. Ranson, Cincinnati, Ohio, Assignor of one half to the Emerson & Fisher Company, same place.
326,597. Rock-Drill. Henry C. Sergeant, New York City.
326,627. Dredging and Grappling Apparatus. Heman Clark, New York City.
326,631. Furnace for Steam-Boilers. Miers Coryell, New York City.
326,642. Portable Steam Pumping-Engine. John Gwynne, London, England.
326,657. Process of Manufacturing Permanganates. T. Kempf, Berlin, Germany, Assignor to the Chemische Fabrik auf Actien, same place.
326,661. Expanding Drill-Bit for Artesian Well-Boring. Charles C. Lane, San Francisco, Cal.
326,671. Spark-Arrester and Smoke-Consumer. John G. Nessel and William H. Stein brecher, Detroit, Mich.
326,681. Rock-Drill. Henry C. Sergeant, New York City.
326,682. Rock-Drill. Henry C. Sergeant, New York City.
326,746. Combined Gang-Punch and Bending-Machine. W. H. Johnson, Racine, Wis.
326,760. Process of Extracting Copper from its Ores. Eugenio Marchese, Genoa, Italy.
326,772. Rod and Bolt-Cutter. David R. Nichols, Brockville, Ontario, Can.
326,804. Blast-Furnace. Victor O. Strobel, Philadelphia, Pa., Assignor to Gordon, Strobel & Laureau, same place.
326,806. Barb-Wire Machine. John Stubbe, Pittsburg, Assignor to Thomas B. Kerr, Alleghany City, Pa.
326,807. Dumping-Car. James H. R. Talley and Charles P. Barnes, Sheldon, Mo.
326,808. Ore-Concentrator. Horace P. Tobey, Wareham, and George B. Thayer, Boston, Mass., Assignors to the Golden Gate Concentrator Company, Boston, Mass.
326,858. Miner's Lamp. John Fern, Scranton, Pa.
326,865. Manufacture of Coverings for Steam-Pipes, etc. Richard Hammill, Chicago, Ill.
326,877. Steam-Boiler Furnace. Frederick Leadbeater, Detroit, Mich.
326,908. Art of Making Rails. William R. Jones, Braddock, Pa.
326,928. Conveyer Apparatus. Hervey Smith, Erie, Pa., Assignor to George C. Blickensderfer, same place.
326,929. Automatic Conveyer Apparatus. Hervey Smith, Erie, Pa., Assignor to George C. Blickensderfer, same place.

FURNACE, MILL, AND FACTORY.

Messrs. Gordon, Strobel & Laureau, of Philadelphia, have concluded a contract with the Joliet Steel Company, by the terms of which they engage to reproduce at the Joliet furnaces the economical work reached at South Chicago under the advice of Mr. F. W. Gordon. This gentlemen is to assume the direction of the blast-furnace practice at once, and it is expected that the guaranteed economy will be reached in from two to three months.

The beautiful Falls of Montmorency, seven miles from Quebec, are now to be utilized in lighting the city of Quebec by the electric light. The experiment in lighting Dufferin Terrace was to be made this week.

This has been the busiest month the Glendon Iron Company has had this year. During the four weeks ended to-day, it shipped between 10,000 and 15,000 tons. Forty car-loads of iron left the works yesterday.

The Lehigh Zinc and Iron-Works at South Bethlehem are running to their fullest capacity, night and day, to keep up with orders that continue to come in. The company will in a few days begin the erection of twenty-four new oxide furnaces.

The new Blake multiple crusher mill at the Haile gold mine, South Carolina, has been started up, and is mining to its full capacity (between 200 and 300 tons a day), and is giving great satisfaction.

The *Age of Steel* says that C furnace, which the lessees of the Vulcan Works have blown in, made 80 tons of iron on September 23d, but that the daily output has probably been increased considerably by this time. In regard to the rest of the plant, the lessees propose to get thoroughly prepared before starting up, which, however, does not imply a far-removed resumption of operations.

In Brooklyn, New York, on September 29th, an application was made for a receiver of the property of the Parrott Iron Company. The company owns 12,000 acres of land near Greenwood Lake, a number of houses rented out, water-right in the lake, several foundries, sheds, etc. The proceedings are brought to terminate the corporate existence of the Parrott Iron Company.

It is said that the works of the Union Iron and Steel Company, Chicago, will be started up soon, giving employment to between 2000 and 3000 men. The company has been entirely reorganized.

The Baltimore Pulverizing Company is erecting works at Feli's Point, Baltimore, Md., under the personal supervision of Mr. Henry G. Penniman, who will be the manager. The works are designed to pulverize all classes of minerals. The pulverizing will be done by a pneumatic process, which is a novelty in itself, and is expected to bring about great changes in the phosphate business, being simple as well as economical. Mr. F. A. Luckenbach, of New York, the inventor of the process, is placing the machinery in position, and expects to begin work about October 1st. A 100 horse-power sectional boiler is in position, and the other machinery is daily arriving. Among the contracts already made are large quantities of gold and silver ore from North Carolina and Georgia. A ton of gold ore is now on its way from New Mexico to be pulverized by the new works.

One thousand tons of steel rails for the Denver & Rio Grande Railroad were recently shipped by Carnegie Brothers. The rails are to be used to extend the road from El Moro, Colorado, down into the coking fields, which will be largely developed during the coming winter.

The rolling-mill at Kittanning, Armstrong County, Pa., is now running full-time after an idleness of more than a year.

LABOR AND WAGES.

The Cleveland strike is at an end. At a mass-meeting of the striking iron workers, September 27th, it was unanimously agreed that the men should return to work as rapidly as they could be taken back. This action was taken upon the advice of the strikers' committee, which counseled the men that to prolong the fight was useless. There will now be no room for about 1500 of the men, and it is understood the turbulent foreigners will be excluded. The mills of the Cleveland Rolling-Mill Company will henceforth be conducted on a new plan, involving the abolition of the boss system and the letting of each department under contract, the owners thus escaping responsibility for the management of the mills.

A dispatch dated Rawlings, Wyoming, September 26th, says that the Chinese are all at work in Rock Springs mines, and considerable coal is turned out. A few white miners have accepted passes to other points. Those remaining refuse to go to work. The railroad company has, it is said, made arrangements to import 200 Mormons from Utah and Idaho to take their places in the mines. Winter quarters are constructing for the troops now here.

A Salt Lake City dispatch, dated October 1st, says that there are good reasons for believing that inside of ten days a general strike of the Knights of Labor employés of the entire Union Pacific system will be ordered, unless in the mean time the railroad company complies with the demand that the Chinese at Rock Springs, as well as Clark, the Superintendent, and Beckwith, Quinn & Co., who supply goods and pay the miners at that point, be removed. These demands the company has positively refused. About two thirds of the Union Pacific employés are Knights of Labor, and the order is fast increasing.

Both the Union and Central Pacific coal mines at Almy are idle, throwing out of employment about 400 men. The Chinese have been worked at both of these, but it is understood that they are not to be employed hereafter, but at Rock Springs Chinese labor is to be concentrated and that place made a Chinese camp. It is doubtful whether they can be protected in Wyoming, except when soldiers are in sight.

The men employed in the mines at Carbon, Wyoming, and at Louisville, Colo., struck to-day, and General Manager Callaway received official notification from the Knights of Labor at both camps that the miners would not return to work until all Chinamen were dismissed. Callaway at once ordered the closing of both mines. There are 500 men at Carbon and 200 at Louisville, all whites.

The employés of the Cumberland Nail and Iron-Works at Bridgeton, New Jersey, have been on strike for nearly seven months for a 10 per cent increase in wages. The company has announced that it will pay the increased wages after two weeks' work. Four hundred men went to work September 29th.

A press dispatch, dated Pittsburg, Pa., September 28th, says that nine delegates, representing the 1500 railroad coal miners who withdrew from the Miners' Association one year ago, met here this afternoon for the purpose of forming a new organization and demanding an advance in wages. After a stormy session, definite action on the question of reorganization was postponed, and a resolution was adopted requesting the officials of the Amalgamated Miners' Association to call a general convention of railroad miners as early as possible, to consider the advisability of asking an increase of a half-cent per bushel in the mining rate. Dissatisfaction is reported from several sections on the railroad, and another strike in the near future is predicted. The river miners' strike is now in its fourth week, with no indications of an early settlement of the troubles.

The Pittsburg *Telegraph* says that the trouble among the miners on the Baltimore & Ohio Railroad, at Peters's Creek, has been settled, and the miners will commence work. The mine has been idle since the strike last spring, on account of the men refusing to accept 2¼ cents. They have been offered 2½ cents from the first of October, if they will work for 2¼ till that time. They have accepted the condition. State Secretary Davis has been notified of a convention of miners to be held in Chicago on October 15th. A full representation of Pennsylvania miners is asked for. The object of the meeting is to adjust market and mining prices in such a way as to avoid strikes and lockouts, and give to each party an increased profit from the sale of coal.

TRANSPORTATION NOTES.

The Norfolk & Western Railroad Company reports net earnings for August $12,754 less than for the same month last year; and for the first eight months of this year, $31,772 less than for the same period in 1884.

COAL TRADE NOTES.

MARYLAND.

The Pittsburg *Telegraph* says: The Maryland Coal Company, at Lonaconing, under the supervision of Mr. Frank E. Brackett, is operating three mines here steadily, making full-time. At present, 380 men are employed.

The American Coal Company operates the Jackson mine. Mr. A. Jackson Clark has charge of these works, employing 250 men.

The New Central Coal Company has three large mines in this field, all under the supervision of Mr. Duncan Sinclair. The Big Vein mine at Lonaconing and the Midlothian at Frostburg have both been idle for some time. The large Kountz mine, near Lonaconing, is running steadily under the supervision of Mr. John Douglass, employing 235 men full-time.

The George's Creek Coal and Iron Company has three mines in operation near Lonaconing. These works are in charge of Mr. John Douglass. Trade with them has been a little slack this summer, the men averaging about half-time; at present, the company employs 275 men.

The Consolidated Coal Company has five mines in operation in the neighborhood of Frostburg. The Huffman mine, in charge of Mr. Joseph Thomas, is entered by a slope, and is worked in lifts, having five of them now working. Here is, probably, the longest wire rope in use in any similar work in the country, being 5280 feet long. With this rope, 1300 tons of coal are daily hoisted, and, should times require it, much more could be brought up with it. Some 400 men are employed in these works. The Ocean mine, four miles below Frostburg, is the next largest mine, in charge of Mr. John Ford. It is also entered by a slope 3000 feet to the lower lift. It is running two thirds time, employing 200 men. The Eckert, New hope, and Alleghany are all large mines, but not so extensively operated, employing between 300 and 400 men.

The Borden Mining Company is operating the only shaft in the region. It is 164 feet deep, and well supplied with machinery. Mr. William G. McMillen has charge, employing about 200 men, averaging half-time. This company also operates a drift mine above town, where about 40 men are employed, under the supervision of Mr. John Davis. From half to two thirds time is made here.

The Blaen Avon Coal Company has an extensive mine two miles back from Frostburg. This is a drift opening with plane 850 feet in length to chutes. Mr. Archy Stewart has charge of these works, employing about 100 men half-time.

Hutchins & Brothers, of Frostburg, have recently opened a new mine near the Ocean, which they are operating steadily under the management of Mr. Owen Hutchins, employing about 40 men steadily.

WEST VIRGINIA.

A correspondent of the Pittsburg *Telegraph* writes from Piedmont as follows: No. 1 and No. 3 mines of the Elk Garden Company are in full operation, giving employment to 270 men. This is the thickest uniform soft coal seam operated anywhere in the United States. It averages 14 feet, all of which is mined out and shipped to market. No. 2 mine has been closed for a couple of months.

Davis Brothers have opened two mines farther up the road, but are not yet doing a very large business. One opening is in the 8-foot seam at Thomas and the other in the 11-foot seam at Davis. Between 400 and 500 tons are shipped weekly.

During the last year, the Atlantic & George's Creek Consolidated Coal Company opened up a fine mine on the opposite mountain from the Elk Garden mines, under the supervision of Mr. L. T. De Witt. Its old mine at Pekin, on George's Creek, has been worked out and abandoned. At the present time, 100 men are employed, averaging half-time. About 1500 tons a week are shipped.

The Big Vein Coal Company, of Baltimore, has a large mine at Windom station, nine miles from Piedmont, opened into this large Elk Garden vein. About 100 men are employed, but at the present time they only average half-time, the shipments averaging 1500 tons a week.

At Westernport, the Franklin and Phœnix mines of the Maryland Union Coal Company are under the supervision of Mr. P. E. Haldeman. The Franklin mine is reached by an inclined plane, in two divisions, 3000 feet in length. At the top of this plane, two openings are worked under the supervision of Mr. P. Grant. During the past year, another opening was made into the upper seam, reached by an inclined plane 450 feet in length. This is the only opening made into this seam on the creek, and the coal proves

to be of excellent quality for steam and blacksmithing purposes. It is from 5½ to 6½ feet thick, with a slate one inch and a half thick running through it ten inches from the bottom. This new mine has been well opened up, the main heading being already driven in 708 feet. with several butt headings turned off from it. This opening will secure to the company a large quantity of excellent coal. At the present time, the mines are running from half to three-quarter time, depending entirely on orders. About 135 men are employed. The Phœnix mine has been idle for some time.

Barton is five miles from Piedmont, where is found the large mine of the Potomac Coal Company, operated by Black, Sheridan & Wilson. This work has been for the last three years the steadiest running mine on the creek. Capt. John Sheridan has charge, with head-quarters at Piedmont. Many important improvements have been made at the chutes and the mines since this company took charge, by which it is enabled to ship all kinds and grades of coal. About 270 men and boys are employed. The shipments last month were 20,000 tons. The men get steady work.

The Swanton Coal Company, S. S. Lee & Son, of Baltimore, is opening a mine here, shipping 200 tons daily and employing 50 men.

GAS AND PETROLEUM NOTES.

Exports of refined, crude, and naphtha from the following ports, January 1st to September 26th :

	1885. Gallons.	1884. Gallons.
From Boston	6,886.220	5.258.915
Philadelphia.....	111,350.803	65.766,423
Baltimore	8,825.774	9,701,079
New York..... ...	280,278,477	280,263,497
Total exports	407,341,274	360,989,914

A dispatch from Toledo, Ohio, September 29th, says that a delegation from the Common Council opened an old artesian well on Adams street to-day, and in a few minutes enough natural gas had collected to furnish a bright flame. At midnight, the gas was still burning. Great excitement prevails throughout the city.

GENERAL MINING NEWS.

CALIFORNIA.

Bulwer.—The superintendent reports as follows, September 21st :

The uprise from the main north drift has advanced 25 feet, and is up 150 feet, at which point a drift will be started south. The ledge is 2½ feet wide, and all ore. The west cross-cut from rise No. 2 has been driven 11 feet. Two have begun to stope on Ralston No. 2 south drift, by which means the company is prospecting the ledge and at the same time accumulating oil. Nine men are employed.

Bonanza King.—The Calico *Print* says : Since the burning of this company's mill in August, almost a complete shut-down has taken place. The insurance on the property has been adjusted and paid, the President, and Wilson Waddingham, has gone East to New York, to see what his company is going to do. A new mill without doubt will be erected during the winter, perhaps of greater capacity than the last. When the *débris* of the old mill is cleared up, every thing will will be shut down to await the action of the company. The mine has never had more ore in sight than at present, and especially at the lower levels, the 7th and the 8th.

Standard.—The Bodie *Free Press* says that the retimbering of the shaft and station at the 400 level was completed and the raising of ore resumed on September 15th. The ore-bodies in the various drifts continue to look well. Work at the Standard mill was stopped on September 13th, and the Bulwer-Standard started on the 15th, and is now running steadily.

Young American.—The *Sierra County Tribune* says that the vein has been found in the lower tunnel of this mine. At the point where it was tapped, the ledge measures 3½ feet strong, and is just as rich in free gold as any place in the upper workings. The lower tunnel is in the hill between 600 and 700 feet, and the distance from there to the upper tunnel, in a perpendicular line, is about 200 feet.

COLORADO.

The Leadville *Herald* reports the following : There are 144 actively worked lode and placer properties in Lake County at the present time. Out of 140 lode claims, 110 are producing and 30 are prospect properties. The product of the 110 producing lodes is about 1000 tons a day. The Placer District of California Gulch is worked by nearly a dozen different parties, owners, and lessees, and will produce this season about $60,000. The principal workings are those conducted by J. R. Loker, Charles Mater, C. R. Arnold, Thomas Starr, and Mr. Graham.

Arkansas Valley Smelter.—These works are again in operation. One furnace was blown in September 22d, and a second one the next day. During the past few weeks that the works were closed down, a fair amount of lead ore was accumulated, insuring a steady run for some time to come. The sampling-mill of the smelting company, situated at the foot of Harrison avenue, also shows renewed activity. There are now sixteen furnaces in blast in this city.

Dunkin.—During the month of August, this mine shipped 240 tons of fine ore. The shipments during September will probably be about the same. All the work done in the mine is by lessees, who are generally doing fairly well. The De Lay lease, which embraces a small piece of territory about the Emory shaft, is yielding at the rate of from 50 to 100 tons a month. The mineral is secured from old workings and stopes, and most of it was used for filling in openings years ago, when only high-grade ore could be shipped at a profit. The ore extracted by Judge De Lay contains from 25 to 40 ounces silver to the ton. The May lease, including the discovery-shaft, is producing a considerable quantity of fine ore, although it is not doing as well as it did six or eight weeks ago. Work here is prosecuted between the second and third levels, near the Matchless line, where a five-inch streak of galena has been opened up that is yielding high-grade ore. Some little galena ore is also found in flint in another portion of this mine.

Grant Smelter.—These works, at Denver, are treating about 300 tons of ore a day. With the exception of small quantities of sulphide and iron ore, the establishment is receiving no ore from Leadville. The works are handling great quantities of concentrates, composed largely of concentrated mill tailings. About 50 per cent of the ore treated at the works is calcined and melted down into matte before it is consigned to the water-jacket furnaces. The establishment is running thirty calcining and matting-furnaces, and ten water-jacket smelting furnaces. One of the latter is employed exclusively on copper ore, and is daily turning out a large amount of from 25 to 35 per cent copper matte. The company has about 20,000 tons of silver smelting ore on hand, and its receipts are in excess of the average daily consumption. The ore comes not only from Colorado, but from Idaho, Utah, Montana, New Mexico, and other Western States and territories.

Highland Chief.—The various lessees of this mine and its low-grade ore-dumps are doing only moderately well. Mr. James Reed has sunk quite a deep shaft to the west of the main tunnel, in which he has disclosed some fair ore. The new shaft has recently been connected with the workings of the Highland Chief mine. The parties working over the dumps on their property are all doing well. The large piles of apparent waste rock in front of the ore-bins have been found to contain a great deal of paying ore, which was thrown away as unprofitable material, when the mine was first opened. The dumps are hand-sorted, and the coarse ore picked out. The screenings obtained in working over the dumps are hauled down the hill to the intersection of the Iron mine ditch. Three hand-jigs have been erected here, and as the stuff is good jigging ore, large quantities of fine-looking sand are made daily. The results from the jigs are reported to average 30 per cent in lead, and carry nearly 20 ounces in silver to the ton.

Louisville.—This lode, for which the Iron Silver Mining Company made such a bitter but unsuccessful fight in the State and federal courts, is proving one of the bonanzas of Iron Hill. The mine produced a thousand tons last month, but the extent of the ore-body is so great that the opening resulting from this extraction of ore is scarcely noticeable. The output of the mine all along was fair in lead and silver, but during the last few days chloride ore has been discovered, running from 200 to 400 ounces in silver to the ton. The probable quantity of this character of ore is still undetermined. This is the first instance of very high-grade ore being found in any of the mines on the crest of Iron Hill. The value of the new discovery will probably be determined within the next week or ten days. At present, a pump is getting into place in the shaft, and other improvements are making, all of which are indicative of the permanency of the mine and of possibly deeper and more extensive working in the future.

The Aspen *Times* reports the following :

Antioch.—The mill continues running steadily on gold ore. A portion of the mill is kept on custom work, while the remainder is employed in treating gold quartz from the Antioch mine. There are now disclosed in the Antioch mine, according to report, about 40,000 tons of free-milling ore, that will yield seven dollars gold per ton on plates and in battery.

Farwell.—The Farwell Consolidated consists of one thirty-stamp mill, one fifteen-stamp mill, over fifty lode claims, and several miles of placer ground along the gulch. There are probably about 200 tons of ore on hand at the mill, 200 on the dumps of Independence Mountain, and 300 tons on the dump at the Mount Hope mine. The mill, in its present capacity, will treat from fifty to sixty tons of ore a day when the thirty stamps are in operation. There are about fifty men employed about the mines and in the mill. This force will not be materially increased during the present fall and wiuter. An engine and hoister will be placed on the lower placer, below the mill, within the next two weeks, and a shaft sunk, with the intention of reaching bed-rock this fall.

Colorado Central.—The Georgetown *Courier* says : This mine continues to employ about 100 men, and produces an average of $22,000 a month. During the last 15 feet in the 400-foot level, a good vein of ore has been exposed. The 500-foot level has been passing through barren ground for some distance, but some excellent mineral has been encountered in a stope near the heading of the drift. The 600-foot level has been driven 400 feet since January, and is now about under the west ore chimney. The Ocean Wave adit, which is the same as the 600-foot level, is repairing. This adit and its connection with the 600-foot level make a continuous opening on the vein 3000 feet long.

Red Elephant.—The Georgetown *Courier* says : H. A. Mears, the superintendent of this company's mines, informs us that the main work is doing through the Schwartz shaft on the White. The most important lease is that of Van Syckle & Co., on the 8th and 9th levels, at the junction of the Boulder Nest. They are stoping above the eighth level on from 6 to 10 inches of good grade ore, and drifting under the same block of ground on two streaks of ore, one on either wall. A car-load of this ore was shipped last week, which milled 150 and 109 ounces in two classes. Hanley & Co. are running a cross-cut to the hanging-wall on the ninth level, and have opened up from 2 to 6 inches of 215-ounce mineral. Below these lessees, on the tenth level, Potter & Co. are working an extensive lease, from which they shipped a car-load of ore last week that milled in two classes, 205 and 120 ounces. The ground east on this level is leased by Robertson & Co., who are drifting on a fine-looking vein of quartz disseminated with mineral. East of the shaft, on the eleventh level, Edmunds & Co. are operating on good pay. West on the same level, Brosius & Co. are drifting on scattered ore. Woodruff & Co. are leasing upon the Bush-Willis workings of the Boulder Nest. They shipped a car of ore to Denver last Friday, and have another one on hand. Noyes & Co. are leasing east of them, and have exposed from 6 to 8 inches of solid mineral. Several other parties of lessees are engaged in working out small blocks of ground.

Consolidated Ten-Mile Mining and Reduction Company.—This company has been incorporated under the laws of the State of New York, with the following officers : President and Manager, John Caplice ; Vice-President and Treasurer, Charles Latham, of New York ; Directors, Charles Latham, A. D. Churchhill, John Caplice, S. T. Hauser, Benjamin Latham, Jr., and William Latham ; Trustee, Benjamin Latham, Jr. The mines embrace what are known as the Lee Mountain and Latham groups, the former containing seven leads and the latter six, making thirteen in all. Besides these, the company has secured the mill-sites and water rights recently belonging to the Capital Milling Company. Men have already been set at cleaning out the old tunnels and shafts, and work is fairly started on the Lee Mountain, Micawber, Stanton, and one or two other mines.

DAKOTA.

Caledonia.—The superintendent reports that, for the week ended September 20th, there were 1152 tons

of ore milled. Bullion produced for first half of September, 811 ounces. More ore is milled from the lower level, consequently the clean-up the latter part of this month will be an improvement on the first half.

FATHER DE SMET.—There were 2025 tons of ore mined and milled during the week ended September 22d.

GEORGIA.

We take the following from the Dahlonega *Signal:*

BARLOW.—The mill is running steadily, and on full-time, with the usual good results. The cut is looking well, with heavy burdens of pay dirt—enough to supply the mill for years to come.

FINDLAY.—This mine is not at present contributing any thing to the output of the country, for the reason that it is the policy of Captain King not to take out the gold from the rich vein, but to leave it exposed. About nine feet of the *streak* is laid bare, exposing to view an amount of gold astonishing to tell. The Findlay has a record in the past as the richest vein in the State; and at no time since it began to contribute its million pennyweights of gold to the world, has it been better or richer than it is to-day.

GORDON.—On starting up this mine a few months ago, there were only twenty stamps put in; but upon prospecting and opening up the mine, it was soon discovered that the crushing capacity was not sufficient, and thirty stamps more are erecting, making fifty in all, which will be ready for operations by the middle of October.

RAWLSTON.—We are reliably informed that this mine is looking much better than usual, and the yields more than had been anticipated. The mill is kept on full-time.

MICHIGAN.

IRON MINES.

The following statement, published by the Marquette *Mining Journal*, shows the amount of iron ore and pig-iron shipped from the lake ports of that district for the season, up to and including September 23d:

	Gross tons.
Marquette—Iron ore	547,340
L'Anse—Iron ore	19,136
Pig-iron	5,258
St. Ignace—Iron ore	73,764
Pig-iron	5,111
Escanaba, Marquette District—Iron ore	409,941
Menominee District—Iron ore	530,616

Despite the reported improvement in the outlook for the iron trade, the lake shipments of iron ore from the ports of Marquette, Escanaba, and St. Ignace show a diminution of volume from week to week, as the close of the season approaches. For the week closing with and including September 23d, there was sent forward by lake 59,280 gross tons from the three ports named, this being 18,287 tons less than the lake shipments from the mines of this district for the corresponding week in 1884. Of the amount forwarded during the week, 21,090 tons went from Marquette, 34,217 tons from Escanaba, and 3973 tons from St. Ignace. The total shipments by lake up to date—1,580,797 gross tons—falls 465,734 tons short of the quantity that had been sent to market at this date last year. This is an enormous shrinkage, and will not be more than half made up by the combined output of both the new iron fields on the shores of Lake Superior, from which ore is now going forward. Seven of the larger mines have furnished 973,499 tons of the entire amount shipped from the Marquette and Menominee ranges thus far. the shipments of all the other mines amounting to 607,298 tons—considerably less than the combined output of the seven. These, with the lake shipments of each to September 23d, are as given in the following table:

Republic	192,921
Cleveland	169,835
Lake Superior	168,607
Champion	114,332
Chapin	133,735
Vulcan	98,927
Ludington	95,142
Total	973,499

MONTANA.

ALICE.—The Butte *Miner* says: Work at the mines of this company is carried on in the usual manner. The mills are kept running with the ore extracted from the Alice and Magna Charta mines, and the machinery at the mines and mills was never in a better condition. The north and south cross-cuts at the 800-foot level of the Alice are in more favorable ground for driving, and the ledge will be struck in the south cross-cut in ten days.

RISING STAR.—This mine is looking very well, and the usual quantity of ore is extracted. During the past week, connection has been made with the winze running from the 400 to the 500-foot level on the vein. When the Rising Star is cleared of the litigation hanging over it, which now incumbers it materially, it will be one of the most valuable properties in the camp.

NEVADA.

The *Silver State* says that the Spring City Miners' Union has disbanded its organization, and deeded its hall and other property to the public school of the district. The miners notified Superintendent McCurdy, of the Paradise Valley mine, that they would work for $3.50 a day after October 1st.

GRAND PRIZE.—The Tuscarora *Times-Review* says that the stopes of this mine are not looking well and are producing but little ore. The mill is running as usual.

NAVAJO.—At a meeting of the dissatisfied stockholders of this company, held in San Francisco, September 23d, several of the most dissatisfied wanted an explicit statement of the present state of affairs. A committee was finally appointed to confer as to the best action to take in the interest of the stockholders, and report at a meeting to be held September 26th.

COMSTOCK LODE.

The Virginia City *Chronicle* reports the following: The daily shipments of ore from the Comstock mines to the mills on the Carson River aggregate 288 tons. When the mills are in full blast again this winter, the daily shipments will aggregate nearly 1000 tons.

CONSOLIDATED CALIFORNIA & VIRGINIA.—From above the 1750 level, 784 tons of ore were extracted during the week ended September 19th. The ore shipped to the Morgan mill during the week, 729 tons, gave an assay of $20.48 a ton. The bulkheading of the southwest drift on the 1650 level has effectually stopped the current of gas and foul air that at one time threatened to cause a suspension of operations in the mine. The offensive odor rising from the shaft to the surface, which has been a source of great annoyance to residents of the vicinity, has also entirely disappeared. The extraction of ore under the Jones contract from between the 1200 and 1550 levels has been suspended, pending repairs to the Eureka mill. At the Consolidated Virginia shaft, the fly-wheel has been shifted farther aft and south of the position it formerly occupied. The cable reels have also been moved, to counterbalance the weight of the cages. The repairs to the Eureka mill, at which the ore from the Jones lease is crushed, are rapidly nearing completion. There is just sufficient water in the Carson River at present to run 20 stamps out of the 60 at the mill, and enough ore to keep them going will be taken out between the 1200 and 1300 levels.

CROWN POINT.—Surface repairs are in progress. No extensive operations will be carried on below the surface until there is a sufficient volume of water in the Carson River to run the Mexican and Santiago mills at their full crushing power, when the extraction of ore from the 1700 level to the surface will be renewed.

JUSTICE.—The force engaged in extracting ore from the 350 level has been materially reduced, pending repairs to the Thompson mill, which is fitting with a Huntington crusher in place of the stamps heretofore used.

KENTUCK.—Between 40 and 50 tons of ore are daily extracted and hauled to the Rock Point mill.

MONITOR.—The White Pine *News* says: The big ore-chamber on the north side of the gulch in the Monitor mine is about 25 feet deep, nearly oval, and shows that a large quantity of ore has been extracted from it. At this time, about 140 tons are extracted weekly, with a force of fourteen men. This ore mills about $60 a ton, and the faces of the chamber and the bottom show no sign of exhaustion Evidently, this ore-body pitches to the north, and may extend up the mountain for an indefinite distance. In this chamber alone, the Monitor Company has fair promises of ore enough to keep its mill running for several years. At several other points in the mine, ore is extracted and shipped to the mill.

YELLOW JACKET.—From this mine, 160 tons of ore, taken out above the 1300 level, are daily shipped to the Brunswick mill

NEW MEXICO.

LAKE VALLEY MINES.—G. M., in the El Paso *International Live Stock, Land, and Mining Journal*, referring to a note that has been going the rounds that the Lake Valley mines, having unsuccessfully tried smelting and milling, are now about to try leaching the ores, gives the following explanation of the past failures. The story is a very familiar one, and is no doubt strictly accurate in fact: In 1881, an amalgamating mill, Boss continuous process, was built here, under the mistaken notion that the ore was all free-milling and easily crushed. If you will remember that it paid well to ship the tailings made by this mill to Pueblo, you will perceive that a mill of this kind was not exactly what was wanted. With facilities for chloridizing the ores and greater crushing capacity, the mill would have been a success. In 1882-83, a smelter was built, of a pattern that would have done credit to a museum of antiquities. The projectors of this scheme, unfortunately, failed to remember that a metal known as lead was a somewhat important factor in smelting operations. As the ores from these mines contained but a trifling percentage of lead, and no adequate supply could be obtained elsewhere, the smelting scheme fell remarkably flat, but the ores can hardly be blamed for the mistakes made. After proving by two years' shipments of ores that the mines had really some ore, it has now been decided to erect reduction-works here, which, for the first time, have some bearings upon and stand in some relation to the character of the ores that it is proposed to treat. By putting up a continuous amalgamation plant for ores that are not free milling and then a negative smelting plant for ores that contain no lead, only results could be achieved; but the plant now under consideration meets the requirements of the ores; that is, it chloridizes and leaches, or, if found more advantageous, amalgamates them. It is strange how very refractory ore may become, when it is proposed to treat it by a process that postulates a totally different chemical composition from that which the ore really has; but it is believed that the method now about to be introduced will meet the character of the ore and produce satisfactory results.

NEW YORK.

CENTRAL AMERICAN LAND, MINING, AND IMPROVEMENT COMPANY.—This company has been incorporated under the laws of the State of New York to conduct operations in New York, Central America, and elsewhere; capital stock, $1,000,000.

TULTEPIC MINING COMPANY.—This company has been incorporated under the laws of the State of New York. The capital stock is $1,200,000. The objects are to explore for and to mine, reduce, and smelt ore of gold, silver, copper, lead, and other metals, to purchase, reduce, and market and sell the ores thereof, etc.

NORTH CAROLINA.

RUSSELL.—This mine recently announced a clean-up, showing a net result of about $10,000.

UTAH.

BANNOCK GOLD AND SILVER MINING COMPANY.—This company has been incorporated under the laws of Utah. The capital stock is $10,000,000, divided into 100,000 shares of $100 each. The general office is to be in Salt Lake City. The following are the officers: Senator A. S. Paddock, President; M. Shaughnessy, Vice-President; A. L. Thomas, Secretary; Boyd Park, Treasurer; and Edward Egan, Manager. The above-named officers, with John A. Groesbeck and M. C. Thun, constitute the board of directors. The company is to work the Horn-Silver mine. It is estimated that there is $20,000 worth of ore on the dump and $200,000 worth in sight. Shipments of ore will begin at once.

BARBEE & WALKER.—The *Southern Utah Times* says: The strike made by Wilson & Phelps on the north extension of this mine is the most important discovery that has been made in the Silver Reef sandstone deposits for a long time past. It is situated on the White Reef, which crops out plainly for over 1300 feet on the claim. The shaft, at this writing, is down between 15 and 20 feet from the surface. The ledge, which is fully 4 feet thick, underlies a heavy stratum of yellow sand-rock, while the bottom of the incline runs over a bed of green-colored soap-stone. The ore is a soft, iron-stained sandstone carrying horn and native silver, specimens of which will assay up in the thousands. A fair sample of the pay-streak, which is 5 inches thick, assayed 158 ounces, while the whole ledge no doubt carries a good percentage of silver The formation is the same as that in the Tecumseh, Savage, California and other mines on the Buckeye Reef, in which was found the richest ore.

CRESCENT.—The Salt Lake *Herald* of September 13th says: For some unaccountable reason—indeed where there should exist every reason for a move

an opposite direction—Crescent stock has taken a big tumble downward. A few days ago, it was selling for $1.22½. On Friday, Carney was rushing about unable to find any takers at 95 and even at 90 cents. It was thought that the payment of the dividend would rather tend to stiffen the stock, and there is another reason why it was expected that Crescent would be scarce on the market. It has been an open secret for some time past that all was not peace and amity in the tents of the Michigan syndicate, and as far as can be learned from the most authentic sources, the following is the cause of the falling out: The Park City Smelting-Works were builtby the Witheys, under the impression that they could be kept profitably running on Crescent ore. Experience soon demonstrated that this was a fallacy, and the Witheys, who are considerable members of the Michigan syndicate, have of late, it is said, been trying to win the Crescent directors to the notion that the smelting-works were necessary to the continued prosperity of the company. The directors, or the Ferry wing of the directors, as report has it, refused to see this, and hence the strife and dissension. The meeting of the stockholders occurs next month, and (again report says) there will be a big endeavor made to oust President Ferry and to put into his place a man who can be made to see the expediency of buying the smelting-works. There is little question as to the side that local stockholders will take in this battle; most of them are certainly averse to making any expensive acquisitions; the management of the mine is now conducted as economically as it can well be, and the local holders are not apt to range themselves on the side of any change that must result in a still more decidedly foreign administration than that that they are now under. It is impossible, of course, to know how the stock is held by the two Michigan parties; but, from all indications, the coming election will result in a home board of directors. In view of all this, it is somewhat strange that there should not be some lively skirmishing after stock for election purposes; this, however, may come later. Our reports show that the ore continues to come down regularly, so that the fall in price can be due to nothing but the stringency of the local money market.

HONERINE.—The company is sending out 100 tons first-class and 200 tons concentrates per month. Its first-class ore runs 35 ounces silver and 65 per cent lead, while its concentrates go 60 in lead and 25 ounces silver. To get this amount of shipping ore, it mines 700 tons a month, 600 tons of which is concentrated to 200 tons. At the mine, thirty men are employed, on the 4th, 5th, 6th, and 7th levels. Below the 7th, which is 900 feet on the incline, there is so much water as to make mining below that point out of the question until heavy pumping machinery is put in, and it is doubtful whether work will be pushed lower. On the four levels named, the drifts are pushed forward. There are large bodies of ore in the mine, making the property a good paying one. The company owns in all thirty claims. The concentrating mill in town is a good one, and is operated by eight men. During the past year, the property has paid four quarterly dividends of five cents a share, making $50,000 in dividends during the year, and there is enough surplus cash in the treasury to pay another dividend, and leave a good amount still on hand, besides enough ore not shipped to pay another dividend. All the ores are shipped to Pueblo at present, under a contract extending to January 1st.

TOLEDO.—A correspondent writes to the Salt Lake *Tribune* that a large body of high-grade ore has been struck in this mine, which has created a great excitement in the district among prospectors. Two discoveries have been made, one giving a well-defined vein about ten inches wide, the ore giving assays of 192 ounces of silver, $4 in gold, no lead. The other is a vein about fifteen inches wide, the ore assaying 100 ounces in silver. Shipments will be made soon.

VIRGINIA.

A correspondent writes us: The Breen Steel and Brass Company has just contracted for 18,000 acres of Round Mountain at $2 an acre, leaving 10,000 acres still intact in this region. Should that company close the purchase, it will erect an extensive plant in Bland County, Va., on the line of the great deposits of iron and manganese ores of Nos. V. and VII. (R) in Round Mountain. The principal furnace is to be 113 feet high, to produce steel directly from the ore!! The plant, it is claimed, will make steel rails at a cost of $16 a ton by the Breen process. A part of the plant will be prepared for the manufacture of brass by the new Breen patents; and the whole will be connected with existing systems of railroads by the Virginia & Kentucky Railroad.

The Arminius Copper Mines Company, Louisa County, Virginia, of which Mr. W. H. Adams is general manager and mining engineer, employs 300 men in its extensive mining of sulphuret ores of copper and iron.

WINNIPEG.

The British North American Mica and Asbestos Mining Company, with headquarters at Winnipeg, with a capital of $1,000,000, has made application to the Dominion government for an act of incorporation. The company is composed principally of Duluth and Winnipeg capitalists.

MARKETS.

NEW YORK, Friday Evening, Oct. 2.

Silver.

DATE.	London. Pence.	N. Y. Cents	DATE.	London. Pence.	N. Y. Cents.
Sept. 26	47⅛	103	Sept. 30	47½	103⅛
28	47½	103	Oct. 1	47 9-16	103¼
29	47½	103	2	47 9-16	103¼

The Indian exchanges, which for about a fortnight ruled considerably below silver, have advanced to the present rate of silver with a demand so large as to induce the Indian Council to increase their offerings for next week. It remains to be seen if this will advance the silver market or only steady it.

The silver question still attracts much attention in the newspapers, and we have thus far seen no advocate of the proposed Warner bill, which we published last week.

The chief objections to it are:

1st. It makes the purchases of silver unlimited in quantity, and is, therefore, worse than the present Bland act.

2d. It obliges the government to buy all the silver, domestic or foreign, that is offered at what will necessarily be a price *above the market*, and to sell *below the market*. It would always be a losing matter for the government, and a profitable one for the silver brokers, who might or might not be producers.

There is no probability of the Warner bill ever being passed, and there will be a strong effort to stop the compulsory coinage of two million dollars a month, but there is less certainty about the result of this effort.

By withdrawing from circulation *all paper money* below $10 denomination, unquestionably a large amount, probably all our present supply of silver, could be kept in circulation. Certainly all the silver we have, if coined in small coins, 50, 25, 10, and 5-cent pieces, would thus circulate—as a subsidiary coinage made legal tender up to say $20. Large coins are unpopular in every country, and probably a portion of our dollars would have to be recoined in smaller denominations. The subsidiary coins could be brought up to at least the standard of 412½ grains to the dollar, and then would be worth only about eighty cents on the dollar.

The silver market is steady, and there is nothing to indicate any sudden storm in it.

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate of discount, and it remains at 2 per cent. During the week, the bank lost £471,833 bullion; and the proportion of its reserve to its liabilities was reduced from 41 1/16 to 36¾, against 38 per cent at this date last year. To-day, the bank gained £3000 on balance. The weekly statement of the Bank of France shows losses of 12,242,000 francs gold and 2,181,000 francs silver.

Gold and Silver Coins in France.—According to the *Courrier des Etats Unis*, it appears that for some time past a money census has been taken in France by an army of agents numbering twenty thousand, and the result is one of the greatest possible surprises. France has, it would appear, $2,400,000,000 worth of gold coin and $1,000,000,000 worth of silver coin. In these two totals is included $200,000,000 worth of foreign gold pieces, including coins from Belgium, Italy, Greece, Switzerland, and the Austro-Hungarian Empire, and $250,000,000 worth of silver coins belonging to the same countries.

TRANSFERABLE NOTICES AT THE METAL EXCHANGE

The *Metal Exchange Market Report* says:

We are frequently asked by our subscribers, "What is meant by transferable notices, as used in the *Market Report*?" Where dealings are made in lots of uniform quantity and deliverable at seller's option during a particular month, as is the custom on all exchanges, it will generally happen that the same goods will be resold a number of times before the period for delivery is reached. When this happens, much useless labor in examining documents would be caused if each buyer were compelled to receive and re-deliver the property, in addition to the delay of transfers and duplication of checks. To obviate these inconveniences, all the exchanges where commodities are dealt in have adopted a rule by which notice of intention to deliver on a contract about to fall due must be given in a certain form, which can be transferred from one to another of any number of persons by a simple indorsement. Each transfer must be made within from fifteen to thirty minutes, so that the notice can easily pass from hand to hand and usually reach that person who has not re-sold at all during the business hours of a single day. Any one wishing to do so can, of course, "stop the notice" and receive the goods; issuing a fresh one if he should afterward wish to re-deliver. The party with whom the notice may lodge at the end of the day of issue must present it to the issuer, receive the goods, and pay for them at the price stated in the notice, which must always be the "settling price" for the current month on that day; the settling price being the price fixed each day by the Secretary of the Exchange as near as possible to the actual market value, to determine the point to which outstanding contracts must be margined. The passing of a transferable notice does not release any of the contracts involved until the actual delivery is made, when each of the parties through whose hands the notice has passed proceeds to adjust the difference between the price at which his contract was made and that at which the notice was issued. A case in point would be as follows:

A has sold 100 tons October iron to B at $16⅝
B " " 100 " " " " " C " 16⅛
C " " 100 " " " " " D " 16¾
D " " 100 " " " " " E " 16⅜
E " " 100 " " " " " F " 15½
F " " 100 " " " " " G " 16

The time for delivery having arrived, A issues a transferable notice, which is passed from hand to hand until it reaches G, who intends to take the iron. He therefore stops the notice and presents it to A, from whom he receives the iron, paying for it at the price stated in the notice, which is $15⅞, the point fixed on the day that the notice is issued to which margins can be called. All parties interested must then settle the difference between the prices in their individual contracts and the "transferable notice price" at which G has just paid A for the goods. The operation of doing this will be as follows:

B pays to A the difference bet. $16⅝ and $15⅞, = $75.00
C " " B " " 16⅛ " 15⅞, = 25.00
D " " C " " 16¾ " 15⅞, = 87.50

By this it will be seen that A receives through his ultimate payment from G and his settlement of differences with B—to whom he originallv sold the iron—exactly the price of the contract made with B; and hat G, in like manner, pays precisely the amount that he would have paid—$1600—if he had received the iron from F.; while the intermediate parties receive or pay in the settlements only the profits or losses on their respective transactions, without being required to handle the documents for the iron, or to give and receive checks for the full amount in a matter their interest in which has already been closed out.

As the seller has the right to deliver any one of 37 different brands on a contract for pig-iron certificates, the value of certificates ordinarily ranges from 62½c. to $1 below that of lots in which the brand is specified. Certificate contracts are based on No. 2, so that for lots of 100 tons and upward of No. 1 in the listed brands, if individually designated, about $2 must be added to the certificate price for the correct quotation. The brands at present listed as a good delivery are as follows, the leading "Lehigh" being understood to include all of the Eastern Pennsylvania and one or two New Jersey brands:

Lehigh.—Allentown, Andover, Bushong, Carbon, Charlotte (Western Pa.), Chickies, Coleraine, Conestoga, Crane, Coplay, Durham, Emaus, Glendon, Leesport, Lehigh, Macungie, Monocacy, Moselem, Mus-

conetcong, Orford, Pequest, Port Oram, Reading, Saucon, Sheridan, South Easton, Thomas, Warwick, William Penn.

Hudson River.—Clove, Hudson, Manhattan, Olcott, Poughkeepsie.

Southern.—Citico, Low Moor, Mary Pratt.

Copper.—This market is dull, and though practically bare of Lake, and the close of navigation approaching, there is no advance in price, which we may quote 11@11⅛c.; Orford and Baltimore, 10¼c.

The small stocks held here either by producers or consumers make it probable that Lake copper will have to be brought forward by rail after the close of navigation, which would necessitate an increase in price.

In England, Chili Bars have recovered slightly and now stand at £40 10s., an advance of 5s. from our last report, which was the lowest point on record.

Messrs. James Lewis & Son, in their Liverpool copper report of September 16th, say that purchases of Chili Bars have been made on American account, and that a considerable quantity of American copper produced is stored on account of the shippers, also that a contract for a further large quantity of Anaconda matte was in course of negotiation.

Copper has suffered from a combination of adverse influences during the past fortnight, and has declined 15s. a ton, £41 12s. 6d. having been accepted for cash bars. Opening at £42 7s. 6d. for sharp cash, £42 2s. 6d. was accepted for about a week's prompt on the 3d inst.; but sympathizing with the advance of iron of about 2s. a ton, £42 17s. 6d. cash was paid on the 8th. Part of the advance in iron being lost that day, Chili Bars also declined, and with the panic in the silver market, Bars being almost unsalable yesterday at 47 5/16d. an ounce, and unusually heavy arrivals of copper—6325 tons in the fortnight—values gradually fell until £41 12s. 6d. was yesterday touched for cash, and £42 3s. 9d. for three months prompt, this being 10s. lower than the lowest point previously recorded.

Some of the purchases of Chili Bars with three months prompt have been on American account, and a considerable quantity of American copper produce is stored on account of the shippers, the present stock here consisting of about 600 tons ingots, 490 tons bars, 878 tons matte, and 90 tons ore, or 1573 tons fine.

As it is known that a contract for a further large quantity of Anaconda matte is in course of negotiation, it is feared that the usual result will follow the conclusion of the contract, and that smelters will be anxious sellers of Best Selected.

From 4000 to 5000 tons (2000 pounds) of Lake Superior ingot copper have been sold to American manufacturers for delivery during the remaining months of this year at 11 cents a pound, equal to £52 12s. 6d. per English ton, less 2½ per cent discount. This is about £6 a ton above the present value of English Best Selected ingots.

The stocks have increased 1665 tons during the fortnight, although the deliveries to smelters under contract have been very large.

The charters are to-day advised as 1100 tons fine, and the market closes rather firmer—Exchange, 23⅛d.

Quotations are: Chili Bars, £41 15s. cash and £42 7s. 6d. three months prompt, buyers. Best Selected ingots, £46 10s. a ton. Ore, 8s., and regulus or matte, 8s. 3d. per unit.

The arrivals here from the United States have been 198 tons bars, 322 ingot, 1651 matte, and 13 ore, equal to about 1538 tons fine; and from Chili, 1569 tons fine. The arrivals in France from the United States have been 290 tons fine.

	Tons fine.		Tons on 1st inst.
Stocks of Chili copper in Liverpool and Swansea are	33,333	against	32,323
Stocks of other than Chili copper are:			
Liverpool and Swansea	5,532	"	5,219
London	5,525	"	5,506
Havre (Chili etc.)	2,049	"	1,726
The quantity of copper afloat by mail and cable to date is:			
From Chili	10,192	"	11,266
Australia	1,600	"	1,350
Total visible supply	58,231	"	57,390

Tin.—The London market has fluctuated between £92 and £90 15s., spot, and £90 for three months, at which it closed to-day. Here, the price of spot is 20½@20¾c., with a quiet and dull market.

Lead.—Lead has been heavy and the market uncommonly dull during the past week, and scarcely any thing more than car-load lots have been sold. The price is held firmly at 4¼c. for Common, 4·30c. for Refined, with no inquiry, and yet no movement to lower the price.

It is rumored that some of the producers are proposing a somewhat different basis for marketing their product, and it is believed the change may bring somewhat lower prices a few weeks hence.

The market has no stocks except those held by the "C. C.," and it is said that this stock has been reduced by sales to about half what it was, or say 2500 tons.

The Richmond Company has not yet shipped the second lot of lead referred to in this report last week; but the stockholders in London appear to be very anxious to dispose of the stock of lead, although the manager at the works seems less disposed to sell, notwithstanding that this lead is still on the market.

Chicago advises that market as firm at 4·15c. Freights yesterday advanced 10c. per 100 pounds from Chicago to New York.

We are informed that the Horn-Silver mine will not turn out any lead during the remainder of this year.

Everett & Post, of Chicago, telegraph to us as follows:

Business has been quiet and of a limited character at 4·15@4·12½c. for some brands. The market remains about the same, if any thing a shade weaker. Since our last report, sales of both soft and hard lead have been made freely, and several hundred tons have been purchased at 4·15c.

Spelter and Zinc.—Spelter, though firm, is not advancing as was expected by many in the trade. We quote 4·45c. bid, 4·50c. asked. Silesian continues to advance in London, where to-day it was £14 7s. 6d., and here may be quoted at 5c.

Sheet-Zinc has advanced somewhat, and may be quoted 5¾@6c. for Domestic.

Antimony.—This metal, so long stationary, has declined in London, where it is quoted, by cable to the Metal Exchange, at £35 for Hallett's. The market here has varied but little nominally, and may be quoted 9c. for Hallett's, 9⅝c. for Cookson's.

Bismuth.—Worth from $2@$2.25 a pound.

Aluminium.—$8@$9 a pound; 10 per cent. Cowles Aluminium Bronze Ingots, $1 a pound; 7 per cent Aluminium Bronze, 78c. a pound; 5 per cent Aluminium Bronze, 56c. a pound; 2½ per cent Aluminium Bronze, 34c. a pound; Aluminium Silver Alloy, composed of 1 part of 5 per cent aluminium bronze and 2 parts nickel, 75c. an ounce.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Oct. 2.

American Pig.—The large sales during the month of September, which were reported in these columns, have "eased up" a little, and we have less business to report during the past week than in the preceding one. Prices remain unchanged at $18 for No. 1 X; $16 for No. 2; and $15 for Forge. Standard Lehigh brands with the usual reduction from these figures for inferior brands.

Our correspondents in other cities report a good business, but no "boom" or indication of a boom. Nor is any desired, makers preferring to keep the market steady at present prices rather than induce the blowing in of other furnaces by an advance of prices.

Scotch Pig.—The advance in prices in Scotland has not affected our market here. Coltness still sells at 19.25@$19.50; Summerlee, $19; and Eglinton, $18 asked. In Glasgow, the quotations to-day were for Coltness, 50s.; Summerlee, 48s.; Glengarnock at Ardrossan, 45s. 9d.; Eglinton, 42s. 3d.

Bessemer Pig.—The market is without change in price, though sales have been quite large, aggregating, it is said, 20,000 tons. We quote $16@$18 for Domestic No. 1.

Spiegeleisen.—20 per cent Spiegeleisen still stands at $25.50@$26.

Steel Rails.—The mill price, $30, is firmly held, and is obtained, while for small lots $31 is now asked, and for small sections $32@$40 is named. We hear of one or two large contracts for delivery well into 1886, made at the ruling price, $30, at Eastern mills. The mills are nearly all well supplied with orders for the next three or four months.

Merchant Iron.—Refined is selling at from $1.80 down to $1.60. Plate and Tank iron, $2@$2.10 Common, and $2¼ Refined.

Structural Iron—is in good demand, with the prospect of large orders for railroad bridge work to be executed at the opening of next spring. Angles are 1·90@2c.; Beams and Channels, 3c.; Tees, 2¼c.

Merchant Steel.—American tool steel, 7½@9c.; special grades, 15@20c.; machinery steel, 2@2¼c. Bessemer; 4½@5c., Crucible.

Philadelphia. Oct. 2.

[From our Special Correspondent].

There have been large receipts of ore this week from foreign ports, and a large number of cargoes are now on the way. The companies are endeavoring to accumulate some stock for the winter and spring, against the possibility of an increasing demand for steel rails. Some preparations are making for the increase of ore mining in Eastern Pennsylvania, over the apprehended improvement in the demand for pig-iron.

Pig-Iron.—The market has not changed materially since it was reported last week. There are are a good many transactions in forge and foundry iron. The average quotations for Foundry are $18 for No. 1; $16.50 for No. 2; and $15@$15.25 for Forge. Every thing is in a satisfactory condition, so the brokers say; but for all that, cases may be mentioned where offers of large lots of a rather ordinary grade of iron have been made at as low rates as were made any time last summer. There is still an abundance of iron to be had if people are not hard to please. Offers have been made in 5000-ton lots for delivery during the winter and spring, but some of these offers emanate from parties who want to blow in. A little more inquiry would encourage the interests in this State a great deal. Those in blast wish to see the markets go no higher, lest the encouragement would start in a number of furnaces that are now on the market for business. A great deal of forge iron has been contracted for, especially for the better makes. The ordinary makes are neglected in a measure, owing to the desire of holders to get prices too near the better makes. Several sales have been made at $15.50, and some is held at $16.

Muck-Bars.—Three or four sales of Muck-Bars were made at $27.

Blooms.—Small lots of anthracite and bituminous blooms are selling.

Foreign Material.—There are negotiations for large supplies of spiegeleisen. Bessemer iron is quoted at $19@$20.

Merchant Iron.—This week's business in bars foots up less than last week's. There is some figuring going on now by mill managers in the interior of the State for a good deal of common iron. Refined iron is firm at $1.80 in a small way. A renewal of the cutting competition is likely. A fair quality of iron is selling at $1.70. By the mixtures made in some mills, a fair iron is offered at $1.60. There is no difficulty in making prices to suit, but quality suffers. Several buyers are exercising a little more care and are stipulating as to the quality to be furnished. Those who have reputations for first-class irons are in the way of more business.

Sheet-Iron.—A slight advance in selling prices has taken place in small lots. Galvanized is quiet this week, and there are signs of a falling off in demand.

Plate and Tank-Iron.—Plates are selling at 2@2·10c. Shell and flange-iron are selling very well; Fire-Box, 4 cents. The plate iron manufacturers have not done as much business at any one time since last winter.

Wrought Pipe.—The manufacturers of wrought-iron pipe repeat the encouraging statements that have been given out for several weeks past. There is no shading of prices, and no disposition on the part of buyers to quarrel over terms. Occasionally, a small order for an exceptionally prompt delivery is sold at a slight advance over quoted rates. There is a large amount of business to be placed this fall, and mill-owners look forward to a very active winter. Skelp iron is $1.80@$1.85.

Structural Iron.—Angles are quoted at 1·90@2c.; Beams and Channels, at 3c. There are indications that several railroad companies are going to place large orders this winter for bridge repair work early in the spring. Some active agents have been catching on to possible business of this character, although nothing is likely to be done at a very early day. There is enough business coming along to keep mills fairly crowded with orders.

Steel Rails.—It would be perhaps the merest guess-

work to give the figures of this week's business in steel rails. Each maker speaks only for himself. A very satisfactory business has been done. All the companies seem to be holding prices at $30, and $31 has been quoted for small lots of standard sections. Light sections are $32@$40. As to heavy lots for late delivery, there is some doubt expressed. It is true that the high prices named have had the effect of checking buyers, and whether they will conclude to come in remains to be seen.

Old Rails.—Two or three parties are holding old rails as high as $18, but have accepted $17.50 rather than lose the chance of a sale.

Scrap.—Selected Scrap is held at $18, and there is a good deal moving at prices ranging from that down to $14. There is not much done in the way of fish-plates, steel scrap, machinery scrap, or other kinds, and prices are not firm.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Oct. 2.

Statistics.

Production Anthracite Coal for week ended September 26th, and year from January 1st :

TONS OF 2240 LBS.	1885.		1884.	
	Week.	Year.	Week.	Year.
P. & Read. RR. Co..	271,913	7,980,675	344,776	8,054,519
L. V. RR. Co.....	144,473	4.116,262	156,195	4,341,377
L., L. & W. RR. Co.	122,622	3,345,660	118 513	3,694,067
D. & H. Canal Co..	98,544	2,641,006	132,590	2,816,562
Penna. RR.:				
N. & West Br. RR.	26,261	867,529	14,270	611,360
S. H. & W. B. RR.	3,023	164,598	.....	130,802
P. & N. Y. RR....	12,310	303,992	14,380	306,118
Penna. Coal Co	41,791	931,790	40,333	941,125
Penna. Canal Co....	16,631	295,644	12,339	305,020
Shamokin Div., N. C. RR	22,245	705.528	25,301	746,984
Lykens Valley.....	*10,500	368,435	9,965	402,450
Total...	770,313	21,721,119	868,662	22,350,384
Increase..	.. ...		....	.....
Decrease	98,349	629,265	....	.....

* Estimated.

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Production for corresponding period :

1880.....16,756,073	1882.....21,027,176
1881.....20,422,349	1883..... 22,997,226

Production Bituminous Coal for week ended September 26th, and year from January 1st :

Tons of 2000 pounds, unless otherwise designated.

EASTERN AND NORTHERN SHIPMENTS.

	1885.		1884.	
	Week.	Year.	Week.	Year.
Philadelphia & Erie RR	18	21,159	.....	.....
**Cumberland Region, Md.*.....	62,192	2,019,852	61,820	2,080,722
**Barclay Region, Pa.*				
Barclay RR.....	5,208	175,431	7,060	223,166
**Broad Top Region, Pa.*				
Huntington & Broad Top RR.....	‡	109,377	4,677	143,953
East Broad Top....	.....	.....	.....	.....
Clearfield Region, Pa.				
Snow Shoe.....	2,332	104.195	3,248	133,205
Karthaus (Keating)	2,684	90,162	2,051	35,939
Tyrone & Clearfield	48,557	2,116,326	59,230	2,292,793
Alleghany Region, Pa				
Gallitzin & Mountain....	9,328	381,541	9,202	283,237
Total 130,319		5,018,043	147,348	5,193,015

* Tons of 2240 lbs. ‡ Report not received.

WESTERN SHIPMENTS.†

Pittsburg Region, Pa.				
West Penn RR.....	3,529	164,719	5.813	205.741
SouthwestPenn.RR.	2.238	73.815	1,659	94,624
Pennsylvania RR...	7.012	156,039	5,812	203,070
Westmoreland Region, Pa.				
Pennsylvania RR...	27,228	876,037	28,083	960,402
Monongahela Region, Pa.				
Pennsylvania RR...	4,501	199,626	3,697	112,944
Total.....	44,508	1,470,236	45,064	1,576,781
Grand total	174,827	6,488,279	192,412	6,769.796

† Considerable gas-coal shipped East, of which no division is made in report.

Production of Coke on line of Pennsylvania RR. for week ended September 26th, and year from January 1st :

Tons of 2000 pounds.

	1885.		1884.	
	Week.	Year.	Week.	Year.
Allegheny Region.	4,174	133,907	2,819	99,285
West Penn. RR....	1,500	35,149	... ..	24,865
Southwest Penn.RR	27,642	1,331,310	26,579	1,625,030
Penn. & W. Region	5,728	171,395	4,183	142,472
Monongahela	2,021	69,644	1,090	55,905
Pittsburg Region.	.....	.. ...	.....	136
Snow Shoe.....	1,101	13,410	141	16,910
Total....	42,166	1,754,815	34,812	1,964,603

Chesapeake & Ohio Railroad Company's report of total output and distribution of coal and coke. Received from mines on line of Chesapeake & Ohio Railroad (including mines on Lexington Division) for the week ended September 21st and year from January 1st. Tons of 2000 pounds :

	Week.		Year.	
Kind of coal.	1885.	1884.	1885.	1884.
Cannel.....	1,390	.....	19,010	14,815
Gas.....	2,126	5,621	247,454	221,166
Splint and block	5,208	5,419	116,108	70,968
New River, etc.	9,350	4,888	411,272	294,540
Coke.....	2,372	2,364	85,287	49,138
Total...	20,446	18,292	879,131	650,627

Anthracite.

There has been a slight improvement in the demand since our last, and prices are slightly higher. Advances have been made by several of the companies with considerable noise ; but the prices named are not those at which much coal is sold, although we think that it will be but a short time before these, or even higher, prices will be secured. The Delaware & Hudson Canal Company announces the following net prices : Stove, $3.85 ; Chestnut, $3.50 ; and Broken and Egg, $3.25. The Lehigh & Wilkes-Barre Coal Company quotes Honey Brook at $3.65 for Broken and Egg, $4 Stove, and $3.40 Chestnut ; Wilkes-Barre Egg is quoted at $3.50 ; and Plymouth red ash Stove at $4.75, and Chestnut $3.75. The prices of this company are all gross. The Reading Company quotes Stove at $3.85 net ; Chestnut, $3 ; Broken and Egg, $3.10 ; and hard Broken and Egg at $3.25. We get some quotations for Stove at $3.70 and plenty at $3.75.

Buyers have been delaying purchases until it will be difficult to fill all the usual fall orders in the time demanded. This is bound to make prices very firm, and probably higher for a while. There are those in the trade who think that the coal business has passed its worst for some years. There are some indications that this may be true, especially if the trunk line presidents succeed in carrying out the arrangements upon which they entered yesterday, while again there are some very strong indications of much worse trouble than the trade has seen for years. It is very evident to us that the Lackawanna Company is preparing to make a demand for a much larger allotment for next year than it has this year. We can not see what companies are willing to make the concessions. There has been much talk of a peace programme between the Reading and Pennsylvania railroads, in which the latter will join the combination for 1886. This the officials of both companies deny, and especially the officials of the Pennsylvania Railroad. A denial, however, does not prove any thing ; for the Pennsylvania officials denied most emphatically that anything was going on in South Pennsylvania and Beech Creek affairs, when, in fact, the whole matter was agreed to. There must be a consideration to every agreement. We can not see what consideration the Pennsylvania can offer the Reading. The only one intimated so far is that the former will not, at great cost to itself, injure its rival. At the same time, it asks the Reading to forego the prospective Baltimore & Ohio business, share the business of the Schuylkill Valley and give up a portion of the coal tonnage from the Schuylkill District. The Reading Company is unable to meet its fixed charges by millions of dollars with the business it has, and how it can do it by giving a large amount of its traffic to the Pennsylvania road is not shown. It will probably be found, upon this basis, that the Reading would as soon die for a sheep as a lamb, and not accept the harmony proposition. Of course, it may be found at the annual election that the Pennsylvania road controls, either directly or indirectly, the policy of the Reading Company ; in which event, the only conclusion one can draw will be that the Pennsylvania desires to accomplish a certain end, has the ability to do so, and naturally will—the peace between the lion and the lamb, in which they lie down together, the lamb inside.

The Western Association had a meeting in Erie on Wednesday, at which it was decided not to increase prices this month, but to enlarge the shipments by 100,000 tons, making them 650,000 tons. W. L. Scott & Co. "set em up" this time. The meetings of this association are very pleasant for the representatives of some of the companies that have all their expenses paid, and are a good thing for that reason, if no other We can not learn that they are any positive injury to the trade.

Monday's Philadelphia *Ledger* says : The favorable change in the state of the anthracite coal trade noted by us last week progresses slowly. While there is nothing like a "boom" expected, the market for anthracite is likely to steadily improve, and better prices for coal are anticipated. . . . Our latest advices are, that there will probably be no further voluntary restrictions of mining this year. The carrying companies are now endeavoring to discharge all the loaded cars in transit or at tide, in order to supply the demand for cars, some individual operators complaining that they have more orders for coal than they can obtain cars in which to carry their coal to market. . . . The Reading Company's stock of coal at Port Richmond on Saturday was 122,000 tons of all sizes. Of the above, 33,000 tons were stove and small stove, 35,000 tons chestnut, and 40,000 tons pea coal. The stock of broken coal had been reduced to 7000 tons and of egg to 3000 tons, there being vessels at the wharves with orders for more broken and egg—the latter of which is very scarce with the Reading Company—than could be had immediately. The shipments by the Reading Company from Port Richmond last week largely exceeded the receipts of coal at that point. There is said to be a more encouraging inquiry from the East, vessels being scarcer and the demand improving, particularly for special coals. The line and city trade is reported in better shape than at any previous time within the past six months, and advanced prices, it is claimed, are obtained.

The Receivers of the Reading Coal and Iron Company have issued the new circular fixing coal prices for October. The following are the line and city trade prices : Schuylkill white ash, at Schuylkill Haven—Lump, Steamboat, Broken, Egg, and Chestnut, $2.60 ; Stove and small Stove, $2.85 ; Pea No. 1, $1 ; Buckwheat, 60 cents. Schuylkill red ash, at Schuylkill Haven—Egg and Chestnut, $2.75 ; Stove and small Stove, $3 ; Pea No. 1, $1. Shamokin white ash, at Schuylkill Haven—Egg and Chestnut, $2.60 ; Stove and small Stove, $2.85 ; Pea No. 1, $1. Shamokin red ash, at Schuylkill Haven—Egg, $2.85 ; Stove and small Stove, $3.15 ; Chestnut, $2.75 ; Pea No. 1, $1. Lorberry red ash, at Schuylkill Haven—Egg, $2.95 ; Stove and small Stove, $3.25 ; Chestnut, $2.75 ; Pea No. 1, $1. Lorberry red ash, at Pine Grove—Egg, $2.85 ; Stove and small Stove, $3.15 ; Chestnut, $2.65 ; Pea No. 1, $1. North Franklin white ash, at Schuylkill Haven—Egg, Stove, and small Stove, $2.85 ; Chestnut, $2.60 ; Pea No. 1, $1. Lykens Valley red ash, at Schuylkill Haven, via canal—Broken, $3.10 ; Egg, Stove, and small Stove, $3.60 ; Chestnut, $2.85 ; Pea No. 1, $1.85 ; Pea No. 2, $1.20. Lykens Valley red ash, at Pine Grove, via rail—Broken, $3 ; Egg, Stove, and small Stove, $3.50 ; Chestnut, $2.75 ; Pea No. 1, $1.75 ; Pea No. 2, $1.10.

Bituminous.

The demand may be a shade better, but prices are not improved. Shippers are hopeful of a better business, and even expect better prices later in the season. There are said to be more steamships coming here. It will probably be found that freights this way are light, and that the steamers carry most of the coal needed for a round trip.

It is a rather fortunate thing for the bituminous coal trade, that the Beech Creek Railroad has been sold to the Pennsylvania, as now seems to be a fact. So far as we can learn, shippers by that route were to have from 90c. to $1 a ton for their coal at the mines, regardless of the market value, and were to share any amount received above $3.25 per ton in this market. This might be called an extremely "soft snap," and as it is the result of directors in one company contracting with themselves in another, the contracts are not likely to hold long under the new management. Under such a contract, the development of the district would only be checked by reaching the maximum productive capacity, or failing to secure a market at much lower prices than the trade has ever known.

Philadelphia. Oct. 1.

[From our Special Correspondent.]

There is great activity at all points now for egg and stove, and these sizes are getting very scarce at tide, particularly egg coal. Broken, although not so active, is still scarce here. Chestnut is in better demand for the best, but there is still a large accumulation of it. As to pea coal, it continues dull.

Freights are stiffening for small vessels. Large ones have not responded to the advance in New York, and can still be had at 95c.@$1.

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

Name and Location of Company.	Highest and Lowest Prices per Share at which Sales were Made.												Sales.
	Sept. 26.		Sept. 28.		Sept. 29.		Sept. 30.		Oct. 1.		Oct. 2.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon.	1.80												200
Amie Con., Co.			.05		.04		.04						2,300
Argenta													
Bassick, Co.											.35		100
Belle Isle, Ne.													
Bodie Cons., Ca.	1.65						1.70	1.65	1.75	1.70	1.80		950
Bulwer, Ca.	.31	.30			.38				.37				1,200
California, Ne.													
Cal. & Hecla, Mich.													
Castle Creek													
Chollar													
Chrysolite, Co.	1.10	1.05	1.20	1.10	1.25		1.30	1.25	1.25		1.25	1.10	2,832
Colorado Central	1.40		1.40		1.40		1.40						500
Cons. Cal. & Va., Ne.	1.30		1.40		1.45	1.40	1.15	1.10	1.50	1.40	1.45	1.40	3,100
Crown Point													
Dunkin, Co.													
Eureka Cons., Ne.													
Father de Smet, Dk.	4.00	4.70											600
Franklin													
Gold Stripe, Ca.													
Gould & Curry, Ne.													
Grand Prize, Ne.													
Green Mountain, Ca.									.60				100
Hale & Norcross, Ne.													
Hall-Anderson, N. S.													
Homestake, Dk.					17.00		17.00	16.88					235
Horn-Silver, Ut.	2.20		2.20	2.15	2.15				2.10				1,700
Independence, Ne.													
Iron Silver, Co.	1.15										1.10		500
Leadville C., Co.													
Little Chief, Co.	.30	.29			.32		.32				.37	.32	11,700
Little Pittsburg, Co.	.27										.22		725
Martin White, Ne.													
Moulton													
Navajo, Ne.									1.00		1.00		1,100
North Belle Isle, Ne.													
Ontario, Ut.					24.00		25.25		25.00	24.00			110
Ophir									.95				600
Osceola									.95				600
Plymouth	18.50		18.50		18.50			28.00	18.50				155
Quicksilver Pref., Ca.					27.50	27.00	28.88	7.00	29 38	28.50	28.50		2,100
" Com., Ca.			6.75	6.00	7.00	6.75	7.75		7.75		8.25	8.00	3,400
Quincy													
Robinson Cons., Co.			.60				.62						700
Savage, Ne.									1.65				250
Sierra Nevada, Ne.									1.00				700
Silver King, Ar.													
Spring Valley, Ca.													
Standard, Ca.	1.10				1.10		1.10				1.10		1,060
Stormont, Ut.													
Tip Top, Ar.													
Yellow Jacket	2.00												50

NON-DIVIDEND-PAYING MINES.

Name and Location of Company.	Highest and Lowest Prices per Share at which Sales were Made.												Sales
	Sept. 26.		Sept. 28.		Sept. 29.		Sept. 30.		Oct. 1.		Oct. 2.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Allouez													
Alta	.29	.27	.29		.29		.30	.29	.28		.27		6,500
American Flag													
Barcelona, G.													
Bechtel Con., G.													
Belvidere													
Belcher													
Best & B'icher, G. S.									1.40		1.45		400
Big Pittsburg, S. L.													
Bowman Silver													
Bull-Domingo, S.L.													
Cal., B. H., G.	2.50		2.45				2.00				2.50		960
Central Ariz'na, S.							.13						500
Chollar													
Cons. Imperial													
Con. Pacific	.25												200
Cusi													
Decatur													
Durango, G.													
Eastern Oregon													
Goodshaw, G.													
Harlem M. & M. Co.													
Harshaw													
Kossuth													
Lacrosse, G.				.10			.10						1,400
Mariposa Pref., G.													
" Com., G.													
Mexican, G. S.							.35						100
Mono													
New Pittsburg													
Noonday													
North Standard, G.													
N. Horn-Silv'r, S.L.													
Ori'nt'l & Miller, S													
Potosi													
Rappahannock G													
Red Elephant, S.	.04								.04		.04		2,000
Ridge													
Silver Cliff, S.													
Sonora Con.													
South Bodie, G.													
South Bulwer, G.													
South Hite													
South Pacific													
State Line, 1 & 4, S.													
" Nos. 2 & 3, S.													
Sutro Tunnel	.17	.16	.17		.17	.16	.16		.17		.16		12,700
Tamarack													
Tioga													
Unadilla, S													
Union Cons., G. S.					.60		.40	.30	.50				1,400
Utah													

Dividend shares sold, 36,997. Non-dividend shares sold, 26,160.

OUR USUAL TABLE GIVING CAPITAL, ASSESSMENTS, AND DIVIDENDS OF ABOUT 250 MINES IS OMITTED THIS WEEK. IT WAS PUBLISHED IN OUR LAST ISSUE, AND WILL APPEAR AGAIN NEXT WEEK.

Buffalo. Oct. 1.

[From our Special Correspondent.]

This will be a statistical rather than a newsy communication, for the reason that there is but little to write about, and your space is too valuable to "give to airy nothings a local habitation and a name."

You already know the result of the meeting at Erie, Pa., yesterday; therefore I omit details. There is no change in the price-list for October.

Trade is fairly active for hard and soft varieties of coal; prices for the former are steady, and for the latter unsettled. Coke is without any special features; business moderately active, and quotations unvaried.

The freight agents of the Western railroads met together here on Tuesday last to discuss the demoralized condition of the West-bound coal rates, and to take appropriate action to provide, if possible, a remedy. The July rates, on the basis of $1.75 to Chicago and $2 to St. Louis, had been cut fully 25 cents. The New York, Lake Erie & Western claimed that it had a large number of contracts out at the cut figures; therefore it was agreed that, on November 1st, the rates should be on the basis of $2 to Chicago and $2.25 to St. Louis. As I understand it, the July rates will govern new deals until November 1st.

It is rumored that the Alleghany Valley Railroad, backed by the Pennsylvania, is preparing for a fight with the Rochester & Pittsburg. Messrs. Bell, Lewis & Yates, of Buffalo, have built a line from Reynoldsville to Du Bois parallel with the Rochester & Pittsburg; hence the trouble. The Pennsylvania may bid in the road on foreclosure sale.

The demoralization in the freight business continues. The features of the situation are the same as stated in my letter of last week. Receipts of coal are light; vessels are few, but adequate to the requirements of this branch of our lake commerce. Many sail craft, barges, and propellers have gone into winter quarters, the owners having had enough *fun* to last them until next spring. No sail vessels are on the market this week—only line propellers care to load at going rates; but whether, as insurance charges advance to-day, they will continue to do so, is a topic for consideration. Doubtless something must be done to advance rates, or else owners must say farewell to the seas

The situation this morning remains unchanged; the rates to Lake Superior ports were increased yesterday 10 cents a ton.

The shipments of coal by lake from Buffalo from September 24th to 30th, both days inclusive, were 40,170 tons, as follows: 17,320 to Chicago, 10,990 to Milwaukee, 1300 to Superior City, 4650 to Green Bay, 1500 to Port Arthur, 2100 to Fort William, 1670 to Detroit, 450 to Owen Sound, and 190 to Dovor. The freight engagements were at the following rates: 45@50c. to Chicago and Milwaukee; 25@35c. to Duluth and Superior City; 55c. to Racine, on contract to Port Arthur; 50c. to Green Bay and Marquette; 15c. to Toledo; 15@20c. to Detroit; 50c. to Fort William; 40c. to Owen Sound; and 30c. to Dovor.

The coal shipments by canal for the past week were as follows: One load to Syracuse, 60c. gross ton, captain to pay unloading only; 1 load to Oriskany, 58c. gross ton, free loading and unloading; 1 load to Schenectady, 87½c. net ton, captain to pay loading and unloading; and 1 load to Lansingburg, 80c. gross ton, free on and off. The nominal rates: To New York, $1.25 net ton, and to Albany 95c. net ton, captain to pay loading and unloading.

The exports of coal by lake from Buffalo for the month of September were 197,420 tons; for the season to October 1st, 1,069,880 tons, as compared with 1,069,930 tons in 1884, and 883,300 tons in 1883. The similarity of the tonnage figures of this year and last is very striking, varying only 50 tons. Receipts by lake this year, none. Receipts by canal for the month of September, 32,966 tons; the shipments, 2872 tons; for the season to October 1st, receipts, 111,852 tons; in 1884, 115,020 tons; in 1883, 81,148 tons—a decrease thus far this year over last of 3169 tons. The shipments, 21,697 tons; in 1884, 24,878 tons; in 1883, 21,557 tons—a decrease thus far this year over last of 3181 tons. No statistics are at hand of railroad receipts and shipments.

It may be of interest to shippers of coal from Lake Ontario ports to the West to learn that in the distant future vessels will not have to call at Buffalo for "tops" for their cargoes. It appears that the Dominion government engineers have completed plans for the enlargement of the Welland Canal to a 14-foot draught of water, at a cost of one million dollars, the work to begin immediately.

The receipts of coal at Duluth for the week ended September 26th were 17,519 tons.

Boston. Sept. 30.

[From our Special Correspondent.]

At the present time, the main question of interest in the Boston market is, whether the goods, as marked up can be sold. Prior to the advance, a good deal of anthracite had been sold, and parties were and are now clamoring for shipments. The difficulty is with broken and egg chiefly. There is plenty [of stove coal and the smaller sizes at tide-water. Even the individual operators are well sold up and are causing no trouble. Special coals of all kinds are very firmly held, and some agents are so far sold ahead on such coals as to have none to offer for the present. The weather is favorably cool, and the market is undoubtedly in better shape. The advance lessens trade, as it usually does at first, and it is not certain yet that the full advance can be generally obtained. When we look ahead a few weeks, it is easy to foretell the existence of another burdensome accumulation in the hands of individual operators. Then the course of the market is likely to be a repetition of what we have just had. Unless trade is more active than usual in the latter part of November, a drag and decline may be expected; the more so, because there is no real combination among the companies. At present, however, the feeling is one of firmness. There is a disposition to take on a large supply at inland points receiving coal by water freight. Freights are firm.

There is no excitement in bituminous coal, and but little movement any way. For two years past, the soft coal side of the house has come out of the season's wrestle better off than it had reason to expect when its contracts were made. But this year is likely to prove less satisfactory than its immediate predecessors. We quote a delivered range of $3.15@$3.35. We hear of no good coal selling below $3.15, and very few sales are reported at the other extreme of $3.35.

There is a firmer feeling in freights, except at the soft coal ports of Baltimore and Newport News. A large amount of coal is now coming along, averaging about 60,000 tons weekly of late. We quote:

New York, 85@95c.; Philadelphia, 95c.@$1.05; Baltimore, $1.10@$1.15; Newport News, $1@$1.05; Richmond, $1.10@$1.15; Cape Breton, $1.40@$1.50; Bay of Fundy, $1.25.

There is an excellent retail demand. There have been no changes in prices of late. We quote:

White ash, furnace and egg	$4.75@$5.00
" " stove and nut	5.25@ 5.50
Shamokin, egg	6.00
" stove	6.25
Lorberry, egg and stove	6.50@ 7.00
Franklin, egg and stove	7.25@ 7.75
Lehigh, furnace, egg, and stove	5.25@ 5.50
" nut	5.50@ 5.75

We quote wharf prices as follows: Stove, $4.50@$4.75; Broken and Egg, $4@$4.50.

FINANCIAL.

Mining Stocks.

New York, Friday Evening, Oct. 2.

There is nothing of special interest to report in the mining market this week. Business was more active, and the transactions were more generally scattered over the list than last week; but prices were about the same or within small fluctuations, and the number of shares dealt in, except in a few instances, was small. Little Chief was in good demand, and the transactions were quite large. Sutro Tunnel was also in good demand; but as that is almost generally the case, it attracts no special attention. A complete summary of the market is given below. The total transactions were 63,157 shares, which is an increase of 20,681 shares, as compared with the transactions of last week.

The Comstock shares were but moderately dealt in, and sold at steady prices. Consolidated California & Virginia sold at irregular prices, ranging from $1.30@$1.50@$1.40; it was fairly dealt in. Savage sold at $1.65, and Sierra Nevada at $1. Union Consolidated was very irregular, selling at from 60@30@50c., and was fairly dealt in. Alta records an active business, but was a little weak; it sold at from 30@27c. Best & Belcher was quiet and steady at from $1.40@$1.45. Yellow Jacket sold at $2. Sutro Tunnel was very actively traded in, but records no material change in price; it sold at from 17@16c.

The Leadville stocks were moderately active at steady prices. Amie sold at from 5@4c. with a small business. Chrysolite was quite strong at one time, but declined somewhat toward the close; it sold at from $1.05@$1.30@$1.10, with transactions of 2832 shares. Iron Silver sold at steady prices, with a small business, ranging from $1.15@$1.10. Little Chief seemed to be in great demand, and was very actively traded in at strong prices; it sold at from 29@37@35c. Little Pittsburg was a little weak, declining from 27@22c.

The Bodie stocks were quiet and strong. Bodie sold at from $1.65@$1.80, and was but moderately dealt in. Bulwer records a small business at strong prices, selling at from 30@38@37c. Standard was active, but was steady throughout at $1.10. Consolidated Pacific sold at 25c.

In the miscellaneous list, Horn-Silver suffered a slight decline under a fair business; it ranged from $2.20@$2.10. The company does not expect to ship any lead or ore this year. The new shaft is down 1200 feet, and cross-cuts were driven on the 21st ult. to the following distances to intercept the vein: Ninth level, 268 feet; tenth level, 168 feet; eleventh level, 104 feet; twelfth level, 78 feet. On the ninth level, about 50 feet more should reach the vein. Homestake was quiet and steady at $17. Ontario sold at strong prices, ranging from $24@$25¼@$25. The Quicksilver stocks continued to be actively dealt in at strong prices; Preferred sold at from $27@$29⅜@$28½, and Common at from $6@$8¼@$8. Colorado Central was moderately dealt in at strong prices, selling at $1.40. Plymouth Consolidated sold at $18.50.

Caledonia was strong under a small business; it sold at from $2.45@$2.50. Central Arizona was quiet at 13c.

Coal Stocks.

There has been considerable speculation in stocks since our last report, and prices had an upward tendency under the very favorable progress expected and making by the trunk line managers, when the announcement this morning of the failure of William Heath & Co., one of the largest stock exchange houses; also the failure of Henry N. Smith, one of the large operators of the street, brought about a decline and reaction which may terminate with to-day, but is likely to be felt for some time. Earlier in the week, the failure of the firm of Soutter & Co., another house that stood very high in the street, was announced. It is true that these were bear failures; but it is also certain that somebody was hurt, and they naturally tend to the destruction of confidence, temporarily, at least. The coal stocks were very strong, but they also have weakened under the latest failure.

Lackawanna sold up to $104⅛, with dividend of 1¾ per cent on, and up to $103¾ ex dividend. The sales for the week aggregated 197,667 shares. To-day, the stock sold down to $102½, and closed at $103.

Delaware & Hudson had dealings of 6601 shares. It sold at $88⅛ yesterday, and closed at $87¼ to-day. The transactions in Jersey Central aggregated 20,587 shares, at $42¼@$40⅛, closing at $40¾. Reading ranged between $18½ and $17, and closed at $17¼, with sales for the week of 7020 shares.

COAL STOCKS.

Name of Company.	Par value of shares.	Quotations of New York stocks are based on the equivalent of $100. Philadelphia prices are quoted so much per share. Sept. 26. H.	Sept. 26. L.	Sept. 28. H.	Sept. 28. L.	Sept. 29. H.	Sept. 29. L.	Sept. 30. H.	Sept. 30. L.	Oct. 1. H.	Oct. 1. L.	Oct. 2. H.	Oct. 2. L.	Sales from Sept. 26th to Oct. 2d, inclusive.
Barclay Coal														
Cameron Coal	50													
Col. C & I	10	17¼	17	17½		17¾		17½		18	17¼	17½	16⅝	1,790
Ches. & O. RR.	100			7⅞		7½								200
Consol. Coal	100													
Cumb. C. & I.	100													
Del. & H. C.	100	84		86	84¼	85½	85⅜	86⅝	85¾	88⅛	86⅞	88⅜	87¼	6,601
D., L. & W. RR.	50	102½	101½	103¼	101¾	104	103⅛	104⅛	102	103¾	102⅞	103⅜	102½	197,667
Elk Lick Coal Co.														
Lehigh C. & N.†	50			43¾				44	43¾					250
Lehigh Valley RR.†	50			55½	55⅜			55						271
L. & W. C. & I Co.														
Maryland Coal	100													
Montauk Coal	100													
Morris & Essex	50					126		126						39
New Central Coal	100											8¼		100
N. J. C. RR.	100	42¼	41¾	41½	40⅛	41¾	41	41	40¼	42	40¾	41⅜	40½	20,587
N. Y. & S. Coal	50													
Penn. Coal	50													
Penn. RR.†	50			51⅝	51⅛	51⅞	51⅛	51⅝	51⅜					8,539
Ph. & R. RR.*	50	17⅞		18¼	17½	18½	17⅞	18	17¼	17¾	17½	17¾	17	15,911
Spring Mountain	50													
Westmoreland Coal.†	50													

* Of the sales of this stock, 8861 shares were in Philadelphia and 7020 in New York. Total sales, 251,955.
† The quotations for the e stocks are not percentage, but actual price.

Meetings.

Meetings of the following companies will be held at the time mentioned:

Manganese Iron Ore Company, at the office of the company, No. 62 William street, New York City, October 7th, at twelve o'clock M.

Mount Pleasant Mining Company, at the office of the company, No. 18 Wall street, New York City, October 7th, at twelve o'clock M.

New York & Colorado Mining and Milling Company, at the office of the company, No. 181 East Seventy-hinth street, New York City, October 5th, at nine o'clock A.M.

Pipe Line Certificates.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report as follows for the week:

The past week in the petroleum market has again seen limited fluctuations, with at times large and active dealings. The quotations for the most part have been about $1.01, the highest price having been recorded on Tuesday, when it touched $1.02¾, and the lowest last Saturday, when it touched $1. The news from the field has shown a large increase in rigs up and building and in new wells, and yet the total production of oil is barely maintained at the previous monthly record. This, with the steady consumption, is doing more to enhance the commercial value of oil than all the manipulations of the crude market have done. The latter part of this week has witnessed failures of considerable moment in the stock market, and these have undoubtedly aroused the fears of many traders in oil. The certificates, however, continue in strong hands, and while they have been made plenty and carrying rates high, they can readily be called in and the borrowers made to pay for their use. The only weak feature seems to be the ease with which some 500,000 barrels of short oil were covered in to-day's market. Oil may sell lower, but will be a purchase soon.

The following table gives the quotations and sales at the Consolidated Stock and Petroleum Exchange:

		Opening.	Highest.	Lowest.	Closing.	Sales.
Sept.	26	1.00	1 00½	1 00	1.00¼	2,920,000
	28	1.00¼	1.01½	1.00	1.00⅛	5,949,000
	29	1.01¼	1.02¾	1.00¾	1.01⅜	9,513,000
	30	1.01½	1.01⅞	1.01	1.01½	4,611,000
Oct.	1	1.01¼	1.01½	1.00¾	1.00⅞	4,612,000
	2	1.00⅞	1.01½	1.00⅛	1.00⅝	8,241,000
Total sales						35,846,000

San Francisco Mining Stock Quotations.

Daily Range of Prices for the Week.

Name of Company.	Closing Quotations. Sept. 25.	Sept. 26.	Sept. 28.	Sept. 29.	Sept. 30.	Oct. 1.
Albion						
Alpha						
Alta	.25		.20	.15	.15	
Argenta						
Bechtel						
Belcher			1.00	1.00	1.00	1.00
Belle Isle						
Best & Belcher	1.50	1.50	1.50	1.37½	1.37½	1.37½
Bodie	1.62½		1.62½	1.62½	1.62½	1.75
Bullion						
Bulwer						
Challar	1.50	1.50	1.50	1.25	1.25	1.12½
Con. Pacific						
Con. Cal. & Va.	1.25	1.37½	1.37½	1.25	1.37	1.37½
Crown Point	1.12½	1.00	1.00	1.00	1.00	1.00
Day						
Elko Cons						
Eureka Cons						
Exchequer						
Gould & Curry	.85	.90	.85	.75	.80	.85
Grand Prize						
Hale & Norcross	5.25	5.12½	5.12½	4.62½	4.75	4.50
Independence						
Martin White					.35	.35
Mexican	.50	.50	.45	.40	.45	.45
Mono						
Mount Diablo						
Navajo	.70	.65	.60	.60	.65	.60
Northern Belle						
North Belle Isle						
Ophir	.85		.85	.75	.85	.75
Overman						
Potosi	.45	.45	.40	.25	.25	.25
Savage	1.87½	1.87½	1.87½	1.62½	1.75	1.62½
Scorpion						
Sierra Nevada	.95	.95	.90	.75	.80	.80
Silver King						
Tip-Top						
Union Cons		.50	.50	.40	.40	.40
Utah						
Wales Cons						
Yellow Jacket	2.00				1.75	

The following are the financial balances of the principal mining companies doing business in San Francisco on September 1st:

Cash on hand.

Best & Belcher	$39,881.18	Sierra Nevada	$15,022.46
* Con. Cal. & Vir.	51,709 22	Occidental	2,315.59
Gould & Curry	32,218.62	Utah	7,236 86
Mexican	7,384.34	Union Con	3,640.85
Ophir	37,104.55	Challar	32,188.22

Indebtedness.

Hale & Norcross	$37,559.13	Potosi	$4,977.24

* And $34.909.17 assay value of unsold bullion.

Boston Copper and Silver Stocks.

[From our Special Correspondent.]

Boston, Oct. 1.

The market for copper stocks, since our last report, has been fairly active, and prices generally show an improvement over last sales. In Calumet & Hecla, we note sales of 132 shares at an advance from $210@$215, with a small sale at $214, the stock closing in good demand at $213½ bid, $214½ asked. Tamarack advanced on the good outlook at the mine from $68@$76, with sales of 262 shares, and is in good demand at $76 bid, to-day, and none offered under $90. Quincy has also shared in the general improvement, and has advanced from $36 to $39, with sales of 168 shares, and closed quite steady at the advance. Franklin, from some unexplained cause, is a little heavy, and shows a decline from $8½@$7¾. There is not much stock offered, and at the present price it is a good investment.

Sales, 170 shares. Osceola has ruled dull, but without much change in quotations; sales 87 shares, at $12¼ @$13. Total sales for two weeks, 819 shares.

In silver stocks, there is very little doing at either of the Boards; 500 shares Catalpa at 22½c., and 200 Crescent at 8c., comprise all the doings at the Boston Stock Exchange. At the Mining Exchange, Bowman has declined to 4c. a share, and very little trading in it. Sales of Dunkin at 18c. "Cusi," at 95c.@$1. Amie, 4@6c. Miscellaneous stocks, dull and inactive.

3 P.M.--At the afternoon Board, Quincy sold at $38½ and $38, and closed $38 bid. Calumet & Hecla, $213 bid, $214 asked. Franklin, $7¾ bid, $8 asked. Osceola, $12¾ bid. Quincy, $38 bid, $38½ asked. Tamarack, $76 bid, $90 asked.

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Albany			
Baltimore	.58§		
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Beverly	1.00		1.00
Boston, Mass	.95@1.00	1.00@1.25	.95
Bristol		1.05	
Bridgeport, Conn.		.95	.60
Brooklyn		.95	
Buffalo, N. Y.			
Cambridge, Mass.	1.00‡		1.00‡
Cambridgeport	1.00‡		1.00‡
Charleston, S. C.	.75	.80	
Charlestown	1.00		
Chelsea	.95@1.00		.95
City Point			
Com. Pt., Mass.	1.10		.95
E. Boston	.95@1.00		.95
East Cambridge	.95@1.00‡		
E. Gr'nwich, R. I.			.75
Fall River	.90		.70
Galveston	2.00	2.20@2.50	
Gardiner, Me		1.20	
Georgetown, D.C.	.60		
Gloucester	1.05@1.10		
Halifax			
Hartford			
Hackensack			
Hudson			
Lynn	1.10@1.15		
Marblehead			
Medford			
Milton			
Mobile, Ala	1.75@2.00		
Newark, N. J		1.15	
New Bedford	.85@.90		.75
Newburyport			1.05@1.10
New Haven		.95	.60
New London			.70
New Orleans	2.00		
New-Berne			
Newport	1.00		.70@.75
New York		.90	
Norfolk, Va	.50		
Norwich			.75
Norwalk, Conn			.65
Pawtucket	1.00¶		
Philadelphia			
Portland, Me	65*	1.05@1.10	
Portsmouth, Va.	.50		
Portsmouth, N.H.	1.00@1.05	1.15@1.20	1.05@1.10
Providence	.85@.90	1.00	.70
Quincy Point			1.00
Richmond, Va	.60		
Rockland, Me			
Rockport			
Roxbury, Mass.	.95‡		
Saco	1.00†		
Sag Harbor			
Salem, Mass.	1.00@1.15		1.00
Saugus			
Savannah		1.00	
Somerset	.90		
Staten Island		.90	
Trenton			
Washington	.60		
Weymouth			
Williamsbg, N.Y.		.95	
Wilmington, Del.			
Wilmington, N.C.	.75	.90	

*And discharging. †And discharging and towing. ‡3c. Per bridge extra. §Alongside. ‖And towing up and down. ¶And towing. **Below bridge.

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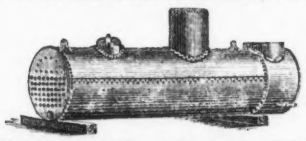

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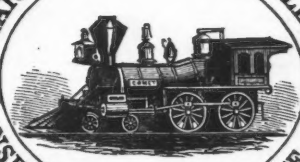

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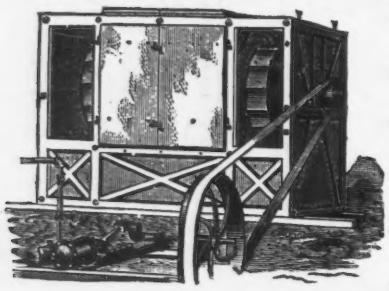

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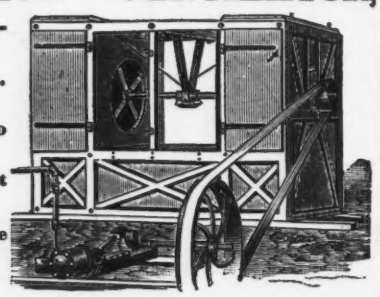

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